1391

Drinking Water Surveillance Program

CASSELMAN WATER TREATMENT PLANT

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CASSELMAN
WATER TREATMENT PLANT

DRINKING WATER SURVEILLANCE PROGRAM

ANNUAL REPORT 1989

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EXECUTIVE SUMMARY

DRINKING WATER SURVEILLANCE PROGRAM

CASSELMAN WATER TREATMENT PLANT
1989 ANNUAL REPORT

The Drinking Water Surveillance Program (DWSP) for Ontario is a monitoring program providing immediate, reliable, current information on drinking water quality. The DWSP officially began in April 1986 and is designed to eventually include all municipal supplies in Ontario. In 1989, there were 65 supplies being monitored.

The Casselman Water Treatment Plant is a package plant that treats water from the South Nation River. The process consists of coagulation, flocculation and sedimentation using an upflow solids contact clarifier, filtration and disinfection. The Casselman plant has a design capacity of 3.18 X 1000 M^3/day and supplies a population of approximately 1,500.

Water samples from the plant: raw and treated and two distribution system sites were taken on a monthly basis beginning in April, 1989 and analysed for 180 parameters. Parameters were divided into the following groups: Bacteriological, Inorganic and Physical (Laboratory Chemistry, Field Chemistry and Metals) and Organic (Chloroaromatics, Chlorophenols, Pesticides and PCB, Phenolics, Polynuclear Aromatic Hydrocarbons, Specific Pesticides and Volatiles). Chlorophenols and Specific Pesticides were analysed in June and November only.

A summary of results is shown in Table A.

The Ontario Drinking Water Objective (ODWO) of 1 FTU for turbidity was exceeded in one treated water sample. The District Officer was notified. All other Inorganic and Physical parameters were below any applicable health related ODWOs.

The ODWO of 350 ug/L for Total Trihalomethanes was exceeded in one treated water sample. The District Officer was notified. Of a total of approximately 110 Organic parameters tested for on a monthly basis, no other health related guideline was exceeded.

During 1989 the DWSP sampling results indicated that the Casselman Water Treatment Plant produced acceptable quality water much of the time, although health related objectives were exceeded in April and July.

TABLE A

DRINKING WATER SURVEILLANCE PROGRAM CASSELMAN WTP

SUMMARY TABLE BY SCAN

SCAN	RAW TESTS	RAW POSITIVE	RAW %POSITIVE	TREATED TESTS	TREATED POSITIVE	TREATED %POSITIVE	SITE 1 TESTS	SITE 1 POSITIVE	SITE 1 %POSITIVE	SITE 2 TESTS	SITE 2 POSITIVE	SITE 2 %POSITIVE
BACTERIOLOGICAL	27	25	92	27	8	29	27	15	55	27	14	51
CHEMISTRY (FLD)	27	27	100	52	52	100	108	107	99	107	102	95
CHEMISTRY (LAB)	189	174	92	189	160	84	324	295	91	316	289	91
METALS	216	135	62	216	128	59	423	260	61	423	259	61
CHLOROAROMATICS	112	0	0	98	0	0	112	0	0	112	0	0
CHLOROPHENOLS	12	0	0	12	0	0	.	.	.	.	.	.
PAH	139	0	0	139	0	0	.	.	.	.	.	.
PESTICIDES & PCB	284	4	1	264	5	1	220	1	0	220	1	0
PHENOLICS	9	9	100	9	9	100	.	.	.	.	.	.
SPECIFIC PESTICIDES	61	0	0	60	0	0	8	0	0	8	0	0
VOLATILES	261	7	2	261	31	11	261	32	12	261	31	11
TOTAL	1337	381		1327	393		1483	710		1474	696	

THE ODWO OF 1 NTU FOR TURBIDITY WAS EXCEEDED IN ONE TREATED WATER; THE ODWO FOR 350 UG/L WAS EXCEEDED IN ALL JULY TREATED WATERS.

A POSITIVE VALUE DENOTES THAT THE RESULT IS GREATER THAN THE STATISTICAL LIMIT OF DETECTION AND IS QUANTIFIABLE
A '.' INDICATES THAT NO SAMPLE WAS TAKEN

DRINKING WATER SURVEILLANCE PROGRAM

CASSELMAN WATER TREATMENT PLANT
1989 ANNUAL REPORT

INTRODUCTION

The Drinking Water Surveillance Program (DWSP) for Ontario is a monitoring program providing immediate, reliable, current information on drinking water quality. The DWSP officially began in April 1986 and is designed to eventually include all municipal supplies in Ontario. In 1989, there were 65 supplies being monitored. Appendix A carries a fill description of the DWSP.

The DWSP was initiated for the Casselman Water Treatment Plant in April of 1989.

This report contains information and results for 1989.

PLANT DESCRIPTION

The Casselman Water Treatment Plant is a package plant that treats water from the South Nation River. The process consists of coagulation, flocculation and sedimentation in an upflow solids contact clarifier, filtration and disinfection. Powdered Activated Carbon is added for taste and odour control. Soda Ash may be added seasonally to adjust the pH. The Casselman plant has a design

capacity of 3.18 X 1000 M^3/day and flows for day of sampling ranging from 0.6 x 1000 m^3/day to 1.3 x 1000 m^3/day. The plant serves a population of approximately 1,500.

The plant location is shown in Figure 1. Plant process details, in a block schematic, are shown in Figure 2. General plant information is presented in Table 2.

SAMPLING LOCATIONS

Water samples were obtained from four DWSP approved locations;

i) Raw - The water was sampled at the raw water surge well prior to chlorination. The sampling lines were stainless steel connected to a DWSP approved pump. The sample tap is located inside the main building.

ii) Treated - The water was sampled after addition of all treatment chemicals after the highlift pumps through a stainless steel sample line.

iii) Site 1 - This site is approximately 0.1 kilometers from the plant. Water is sampled through copper plumbing at the kitchen tap.

iv) Site 2 - This site is approximately 0.7 kilometers from the plant. Water is sampled through copper plumbing at the main floor laundry room tap.

SAMPLING AND ANALYSES

Sample lines in the plant were flushed prior to sampling to ensure that the water obtained was indicative of its origin and not residual water standing in the sample line.

At all distribution system locations two types of samples were obtained: a standing and a free flow. The standing sample consisted of water that had been in the household plumbing and service connection for a minimum of six hours. These samples are used to make an assessment of the amount by which the levels of inorganic compounds and metals may be changed on standing, due to leaching from (or deposition on), the plumbing system. The only analysis carried out on the standing samples therefore, are General Chemistry and Metals. The free flow sample represented fresh water from the distribution main that had been flowing at the sample tap for five minutes before being sampled.

Attempts were made to capture the same block of water at each sampling point by taking the retention time into consideration. The retention time was calculated by dividing the volume of water between the two sampling points by the sample day flow. For example, if it was determined that the retention time within the plant was five hours then there would be a five hour interval between the raw and treated sampling. Similarly, if it was estimated that it took approximately one day for the water to

travel from the plant to the distribution system site, this site would be sampled one day after the treated water from the plant.

Stringent DWSP sampling protocols were followed to ensure that all samples were taken in a uniform manner.

Plant operating personnel perform analyses on parameters for process control (Table 1).

The Casselman Water Treatment Plant, raw and treated water and two distribution system locations were sampled for approximately 180 parameters on a monthly basis beginning in April. The Specific Pesticides and Chlorophenols scans were sampled in June and November only. Polynuclear Aromatic Hydrocarbons and Phenolics are only analysed in the raw and treated water at the plant. As of August the triazine pesticides were only analyzed in the raw and treated water. Laboratory analysis was conducted at the Ministry of the Environment facilities in Rexdale, Ontario.

RESULTS

Field measurements were recorded on the day of sampling and were entered onto the DWSP data base as submitted by plant personnel.

Table 3 contains information on the delay time between the raw and treated water sampling, flow rate and treatment chemicals used and

FIGURE 1

DRINKING WATER SURVEILLANCE PROGRAM

SITE LOCATION MAP

CASSELMAN WATER TREATMENT PLANT

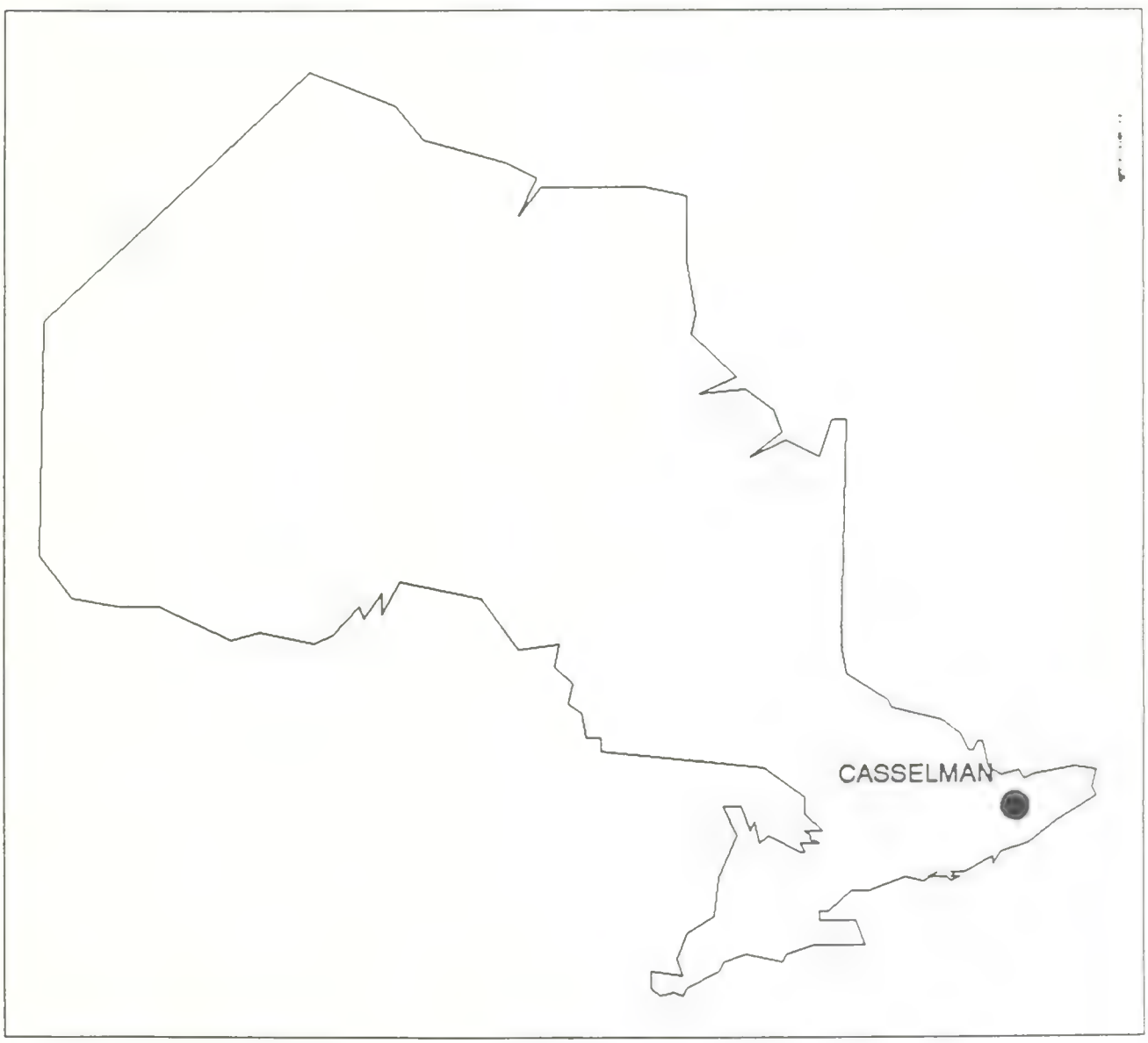
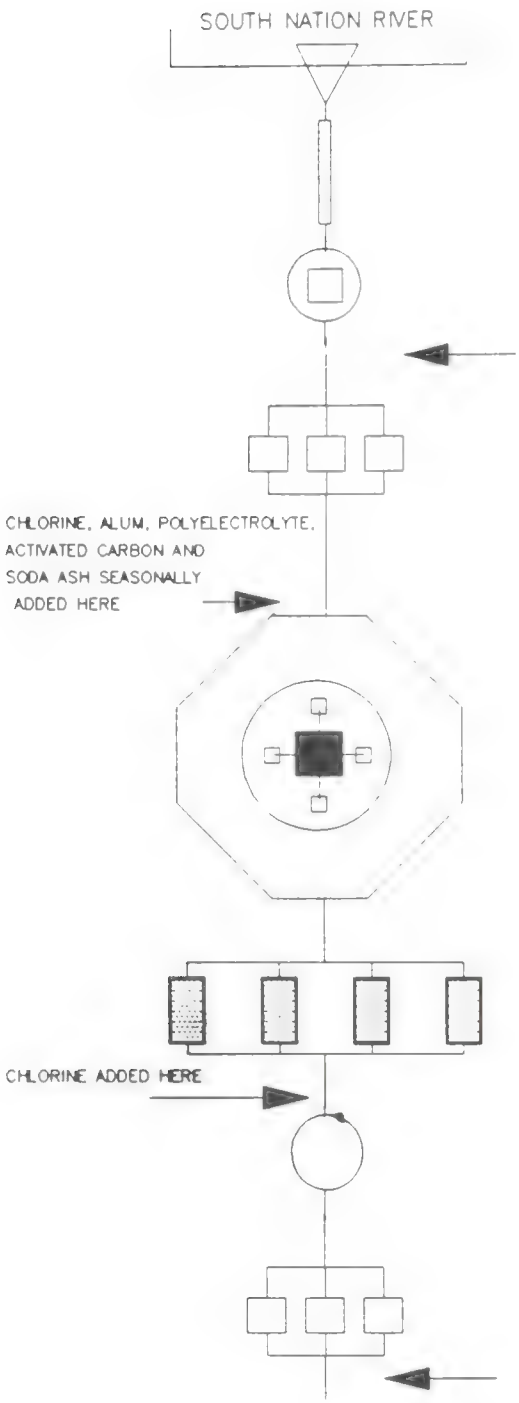


FIGURE No 2

CASSELMAN WTP

SCHEMATIC DIAGRAM


SOUTH NATION RIVER
RAW WATER SAMPLE SITE
CHLORINE, ALUM, POLYELECTROLYTE, ACTIVATED CARBON AND SODA ASH SEASONALLY ADDED HERE
CHLORINE ADDED HERE
TREATED WATER SAMPLE SITE

CHARACTERISTICS

1 INTAKE CRIB

1 CONCRETE INTAKE PIPE

1 CONCRETE SURGE WELL

3 LOWLIFT PUMPS

1 UPFLOW SOLIDS CONTACT CLARIFIER

4 CONCRETE FILTER TANKS

1 CONCRETE CLEAR WELL

3 HIGHLIFT PUMPS

TABLE 1

DRINKING WATER SURVEILLANCE PROGRAM ANNUAL REPORT

PLANT PROCESS MONITORING CASSELMAN WATER TREATMENT PLANT 1989

PARAMETER	LOCATION	FREQUENCY
Chlorine residual - total	After clear well	continuous
pH	Raw water	daily
	After highlifts	daily
Temperature	Raw well	daily
	Clear well	daily
Turbidity	Splitter box	continuous

TABLE 2

DRINKING WATER SURVEILLANCE PROGRAM ANNUAL REPORT

GENERAL INFORMATION

CASSELMAN WATER TREATMENT PLANT

LOCATION:	1 LAVAL STREET CASSELMAN, ONTARIO K0A 1M0 (613-764-5678)
SOURCE:	RAW WATER SOURCE - SOUTH NATION RIVER
DESIGN CAPACITY:	3.18 x 1000M^3/DAY
OPERATION:	MINISTRY
PLANT SUPERINTENDENT:	C. LEVESQUE
MINISTRY REGION:	SOUTHEAST
DISTRICT OFFICER:	MR. G. McKENNA

MUNICIPALITY SERVED	POPULATION
CASSELMAN	1,500

their associated dosages.

Table 4 is a summary break-down of the number of water samples analysed by parameter and by water type. The number of times that a positive or trace result was detected is also reported.

Positive denotes that the result is greater than the statistical limit of detection established by the Ministry of the Environment (MOE) laboratory staff and is quantifiable. Trace (<T) denotes that the level measured is greater than the lowest value detectable by the method but lies so close to the detection limit that it cannot be confidently quantified.

Table 5 presents the results for parameters detected on at least one occasion.

Table 6 lists all parameters analysed in the DWSP.

Associated guidelines and detection limits are also supplied on tables 5 and 6. Parameters are listed alphabetically within each scan.

DISCUSSION

General

Water quality is judged by comparison with the Ontario Drinking

Water Objectives (ODWO's) as defined in the 1984 publication (ISBN 0-7743-8985-0). The Province of Ontario has health related and aesthetic objectives for 49 parameters, these are currently under review. When an ODWO is not available guidelines/limits from other agencies are consulted. The Parameter Listing System (PALIS) recently published (ISBN 0-7729-4461-X) by the MOE catalogues and keeps current over 1750 guidelines for 650 parameters from agencies throughout the world.

Many of the compounds detected are naturally occuring or are treatment by-products.

Plant operational personnel address occurrences of taste and odour or biological water quality parameters. The DWSP does not assess these aspects of the water supply.

As stated under Results, traces do not indicate quantifiable results as defined by established MOE laboratory analytical reporting protocols. While they can be useful in trend analysis or confirmation of the presence of a specific contaminant that is repeatedly detected at these levels, the occasional finding of a trace level of a contaminant is not considered to be significant. **DISCUSSION OF GUIDELINES AND LIMITS THEREFORE, IS ONLY CONDUCTED ON POSITIVE RESULTS.**

Bacteriology

Positive results for the Bacteriology scan were present eight times in the treated water, fifteen times in the Site 1 water and fourteen times in the Site 2 water. The positive parameters were Standard Plate Count, Total Coliform and/or Total Coliform Background.

Total Coliforms at 10/100 mL were detected by the membrane filtration test in the May Site 1 sample. This was above the ODWO level of 5/100 mL. The District Officer was notified. Coliforms at 1/100 mL were detected in the September Site 1 sample; no other coliforms were detected in the treated or distributed water.

Standard Plate Count is a test used to supplement routine analysis for Coliform bacteria. The limit for Standard Plate Count (indicating some deterioration) in the ODWOs is 500 organisms per mL. High Standard Plate Counts were present in the June treated water sample, the June and July Site 1 water and the May, June, July, September, October and November Site 2 water samples. The high Standard Plate Count may be a result of the higher temperatures in the summer months. Standard Plate Counts, above 500 organisms per mL, may indicate that coliforms can be masked. Total Chlorine Residuals of at least 0.20 mg/L were detected in all treated and free flow distribution system samples, which indicates proper disinfection. The chlorine demand was considerable since

maximum total chlorine residuals in the distribution system were only 1.3 mg/L even with a total chlorine dosage of over 16 mg/L.

Guidelines for bacteriological sampling and testing of a supply are developed to maintain a proper supervision of its bacteriological quality; the routine monitoring program usually requires the taking of multiple samples in a given system. Full interpretation of bacteriological quality cannot be made on the basis of single samples. Further, bacteriological limits were developed in acknowledgement that the presence of coliforms may be detected due to their non-uniform distribution throughout the distribution system and the fact that their enumeration is subject to considerable variation. For these reasons, the occasional finding of low numbers of coliform organisms is not unexpected. Routine bacteriological monitoring, as outlined in the ODWOs is carried out by the operating authority.

Inorganic and Physical

Laboratory and Field Chemistry

The aesthetic ODWO of 5 Hazen Units (HZU) was exceeded in all treated water samples and distribution system Site free flow waters. Colour in drinking water may be due to the presence of natural or synthetic organic substances as well as certain metallic ions.

It is desirable that the Temperature of drinking water be less than 15°C; the palatability of water is enhanced by its coolness. A temperature below 15°C will tend to reduce the growth of nuisance organisms and hence minimize associated taste, colour, odour and corrosion problems. The temperature of the delivered water may increase in the distribution system due to the warming effect of the soil in late summer and fall and/or as a result of higher temperatures in the source water. The desired ODWO was exceeded five times in the treated water.

The ODWO recommend a hardness level of between 80 and 100 mg/L as calcium carbonate for domestic waters, to provide an acceptable balance between corrosion and incrustation. Water supplies with a hardness greater than 200 mg/L are considered poor, and would possess a tendency to form scale deposits and result in excessive soap consumption. The treated water had hardness values ranging from 123 mg/L to 384 mg/L.

The European Economic Community (EEC) aesthetic guideline level for Conductivity is 400 UMHO/cm was exceeded in all but the April samples. Elevated conductivity is often assocaited with high hardness levels.

The Langelier Index is used extensively in estimating the corrosion potential of water. An increasingly negative index indicates the

increasing possibility of corrosion. It is considered sound engineering practice to maintain a slightly positive Langelier Index. The Langelier Index for Casselman is consistently positive.

Magnesium levels exceeded the EEC aesthetic guideline level of 30 mg/L in December with concentrations up to 32.2 mg/L.

The Total Ammonium levels are high, in all samples taken in April, ranging from 0.26 to 0.348 mg/L, in the May treated water 0.054 mg/L and the Site 1 water 0.056 mg/L, the August raw water, 0.18 mg/L and the September raw water, 0.116 mg/L. While the European Economic Community has an aesthetic guideline of 0.05 mg/L, the Maximum Admissable Concentration (MAC) is 0.50 mg/L and is set as a result of the concern for potential sewage pollution and its detection. The MAC was not exceeded.

Turbidity in water is caused by the presence of suspended matter such as clay, silt, colloidal particles, plankton and other microscopic organisms. The most important potential health effect of Turbidity is its interference with disinfection in the treatment plant and the maintenance of a chlorine residual. The ODWO of 1 Formazin Turbidity Unit (FTU) was exceeded in the April treated water sample. The District Officer was notified. The field turbidity results for May and October were also above 1 FTU but laboratory values were less. Although field turbidity values are considered more reliable the District Officer was not notified.

Metals

The results reported for the Metals scan were below any applicable health related ODWOs.

The aesthetic Maximum Desirable Concentration of 50 µg/L for manganese as outlined in the ODWOs was exceeded in April in the treated water (88 µg/L), the Site 1 water (89 µg/L) and the Site 2 water (87 µg/L). High concentrations of manganese can contribute to laundry staining and undesirable tastes.

Iron and Manganese levels were lower in most treated waters as compared to the raw water. This is a result of the treatment process. The addition of Alum as a coagulant to the raw water and the resulting coagulation/settling process has been shown to reduce the levels of most metals.

Elevated levels of Copper, Nickel, Lead and Zinc were detected in the standing samples as compared to the free flow distribution samples, indicating that very small quantities of these metals were leached from the household plumbing as the water stood overnight. Although the Langelier Index indicates minimal potential for corrosion some metals will be leached in standing samples in most supplies.

At present, there is no evidence that Aluminum is physiologically

harmful and no health limit for drinking water has been specified. The measure of residual Aluminum in the treated water is important to indicate the efficiency of the treatment process. The ODWOs indicate that a useful guideline is to maintain a residual below 100 ug/L as Al in the water leaving the plant to avoid problems in the distribution system. Aluminum values exceeded the ODWO operational guideline in eight out of nine treated water samples. The levels of aluminum in the raw water ranged from 180 µg/L to 661 µg/L. Monthly aluminum levels in the treated waters were marginally lower and in some instances higher than in the raw water.

Organic Parameters

Chloroaromatics

The results of the Chloroaromatics scan showed that no chloroaromatics were detected.

Chlorophenols

The results of the Chlorophenols scan showed that no Chlorophenols were detected.

The maximum desirable concentration of phenolic substances in drinking water is 2.0 µg/L. This limit has been set primarily to prevent the occurrence of undesirable tastes and odours, particularly in chlorinated water. Phenolics were detected at levels ranging from 1.2 to 13.0 µg/L in the raw water and 1.0 to

5.0 µg/L in the treated water.

Pesticides and PCB (Polychlorinated Biphenyls)

The results of the Pesticides and PCB scan showed that no PCBs were detected and that six pesticides were detected:

Alpha BHC

Lindane

Atrazine

Cyanazine

D-ethyl Atrazine

Metolachlor

There are several isomers of BHC (Benzene Hexachloride); gamma BHC is the active ingredient of the pesticide Lindane; while alpha BHC is the isomer predominantly found in surface waters from the Great Lakes Basin as indicated in results from other water supplies on DWSP.

Alpha BHC was detected at a trace level, once in the Site 2 water.

Lindane was detected at trace levels, once in the raw water, treated water and Site 2 water.

Atrazine was detected in the July treated water at 2,670 ng/L, the Site 1 water at 2,470 ng/L and the Site 2 water at 1,920 ng/L. It was detected in August in the raw water at 5,520 ng/L and in the

treated water at 3,310 ng/L, in the September raw and treated waters at 2,060 ng/L and 1,850 ng/L, in the October raw and treated water samples at 2,060 and 2,070 ng/L and in the November raw and treated water at 640 ng/L and 810 ng/L. Health and Welfare Canada's Interim Maximum Acceptable Concentration for Atrazine in drinking water is 60,000 ng/L. Atrazine was also detected at trace levels, once in the raw water, treated water, Site 1 and Site 2.

D-Ethyl Atrazine is a break-down product of Atrazine. It was detected at trace levels, five times in the raw water, six times in the treated water, twice in the Site 1 water and twice in the Site 2 water.

Cyanazine (Bladex) was detected at trace levels, twice in the raw water, three times in the treated water, once in the Site 1 water and once in the Site 2 water.

Metolachlor was detected at trace levels, once in the raw water, treated water, Site 1 and Site 2 water.

The South Nation River drains an agricultural watershed where pesticides are used. Run off tends to increase their concentrations in the river, which combined with the shallow, low flow nature of the South Nation River may account for the persistence of some of these pesticides. Removal by activated carbon adsorption at the dosages used for taste and odour control, appear to be ineffective.

Specific Pesticides

Results of the Specific Pesticides scan showed that no specific pesticides were detected.

Polynuclear Aromatic Hydrocarbons (PAHs)

The results of the PAH scan showed that no PAHs were detected.

Volatiles

The results of the Volatiles scan showed that eight parameters, other than Trihalomethanes(THMs), were detected:

Benzene

Toluene

Ethylbenzene

M-Xylene

O-Xylene

Styrene

1,1,1 Trichloroethane

Tetrachloroethylene

Benzene was detected at trace levels, once in the raw water, three times in the treated water, five times in the Site 1 water and four times in the Site 2 water.

Toluene was detected at 0.50 µg/L in the May raw water sample,and at trace levels, eight times in the treated water and in all

samples of the Site 1 water and Site 2 water. The detection of toluene at low, trace levels may be a laboratory artifact derived from the analytical methodology. The fact that toluene has only been detected in one raw water sample and is detected in all but one treated and distributed water samples indicates that there is a source of toluene in the treatment process.

Ethylbenzene was detected at trace levels, twice in the raw water, five times in the treated water, four times in the Site 1 water and five times in the Site 2 water.

Meta-Xylene (M-Xylene) was detected at trace levels, twice in the raw water, four times in the treated water, four times in the Site 1 water and three times in the Site 2 water.

Ortho-Xylene (O-Xylene) was detected at trace levels, twice in the raw water, eight times in the treated water, six times in the Site 1 water and five times in the Site 2 water.

The detected trace levels of Styrene are also considered to be laboratory artifacts resulting from the polystyrene shipping containers. The sporadic background levels from this source are in the order of 0.05 µg/L.

The volatiles listed above are typically found on an occasional basis at other water supplies included on the DWSP.

1,1,1 Trichloroethane was detected at trace levels, twice in the raw water, once in the Site 1 water and once in the Site 2 water.

Tetrachloroethylene was detected at a trace level, once in the Site 2 water.

THMs are acknowledged to be produced during the water treatment process and will always occur in chlorinated surface waters. THMs are comprised of Chloroform, Chlorodibromomethane and Dichlorobromomethane. Bromoform occurs occasionally. Results are reported for the individual compounds as well as for total THMs.

Chloroform, Dichlorobromomethane and Total THMs were detected in all treated water samples. Chlorodibromomethane was detected at in most treated water samples. Bromoform was detected at trace levls, twice in the Site 1 water and once in the Site 2 water. The health related ODWO of 350 µg/L for Total Trihalomethanes in drinking water was exceeded in July in the treated water with a concentration of 382 µg/L and 420 µg/L and 359 µg/L in the distributed water. The District Officer was notified. All other Total THM occurrences, ranging from 12.2 to 340.8 µg/L were below the ODWO. Elevated THM levels occurred with high chlorine dosages of 15 - 16 mg/L.

CONCLUSIONS

The Casselman Water Treatment Plant for the sample year of 1989 produced acceptable quality water most of the time, although health related guidelines were exceeded on three occasions.

The health related ODWO for Turbidity was exceeded in one treated water sample in April, the ODWO for coliforms was exceeded in one dsitribution sample site in May and the ODWO for Total Trihalomethanes was exceeded in all treated and distributed water samples in July. No other health related guidelines were exceeded during 1989.

Turbidity levels near and above the guideline, together with elevated aluminum residuals indicates a problem with the treatment processes.

High THM results were associated with high doses of chlorine. The elevated chlorine residuals in the treated water were much reduced in the distribution system and were often not effective in controlling bacteria growth.

More pesticides were detected at this supply than at most other supplies included in DWSP, as might be expected from the agricultural nature of the watershed. None of the pesticides measured on DWSP exceeded drinking water guidelines. The activated carbon treatment applied for taste and odour control was not

effective in reducing pesticide concentrations. The results indicate an adverse impact on source water quality as a result of agricultural activity in the watershed.

The water at from the South Nations River is hard, the treated water exceeds the objective for colour on occasion and some bacteriological deterioration is observed in distributed water in the summer months.

RECOMMENDATIONS

Three recommendations can be made:

1) Treated water turbidity, close to or above the ODWO of 1 NTU, along with high aluminum residuals indicate that the coagulation/flocculation process should be reviewed and optimized.

2) Chlorine dosage and its application points should be reviewed in order to reduce THM levels without compromising the disinfection process and control of bacteria growth.

3) Consideration should be given to the improved application of powdered activated carbon for pesticide removal.

TABLE 3

DRINKING WATER SURVEILLANCE PROGRAM CASSELMAN WTP SAMPLE DAY CONDITIONS FOR 1989

	SAMPLE DAY CONDITIONS		TREATMENT CHEMICAL DOSAGES (MG/L)				
			TASTE & ODOUR	PRE-CHLORINATION	COAGULATION	COAGULATION AID	POST-CHLORINATION
			ACTIVATED CARBON POWDER	CHLORINE	ALUM LIQUID	POLYELECTROLYTE	CHLORINE
DATE	DELAY TIME(HRS)	FLOW (1000M3)					
APR 03	3.0	.9	2.00	2.75	80.60	1.16	.
MAY 09	3.0	.6	2.00	12.40	70.40	1.69	.
JUN 06	3.0	.8	.30	5.00	97.20	1.79	1.25
JUL 04	3.0	1.3	2.00	12.70	77.40	1.78	2.99
AUG 08	3.0	.6	2.00	9.69	83.80	1.87	6.46
SEP 06	3.0	.8	2.00	9.04	73.20	1.76	3.39
OCT 03	3.0	.7	2.00	5.24	84.80	1.33	2.62
NOV 07	3.0	.6	2.09	14.95	106.40	1.01	1.49
DEC 05	3.0	.7	2.00	2.50	81.00	1.35	.

* THE DELAY TIME BETWEEN THE RAW AND TREATED WATER SAMPLING, SHOULD ESTIMATE THE RETENTION TIME

TABLE 4

DRINKING WATER SURVEILLANCE PROGRAM CASSELMAN

SUMMARY TABLE OF RESULTS (1989)

SCAN	PARAMETER	RAW			TREATED			SITE 1			SITE 2		
		TOTAL	POSITIVE	TRACE	TOTAL	POSITIVE	TRACE	TOTAL	POSITIVE	TRACE	TOTAL	POSITIVE	TRACE
BACTERIOLOGICAL	FECAL COLIFORM MF	9	9	0	.	.	.	.	.	.	.	.	.
	STANDRD PLATE CNT MF	.	.	.	9	7	0	9	7	0	9	9	0
	TOTAL COLIFORM MF	9	7	0	9	0	0	9	2	0	9	0	0
	T COLIFORM BCKGRD MF	9	9	0	9	1	0	9	6	0	9	5	0
*TOTAL SCAN BACTERIOLOGICAL		27	25	0	27	8	0	27	15	0	27	14	0
*TOTAL GROUP BACTERIOLOGICAL		27	25	0	27	8	0	27	15	0	27	14	0
CHEMISTRY (FLD)	FLD CHLORINE (COMB)	.	.	.	9	9	0	18	18	0	17	17	0
	FLD CHLORINE FREE	.	.	.	7	7	0	18	17	0	18	13	0
	FLD CHLORINE (TOTAL)	.	.	.	9	9	0	18	18	0	18	18	0
	FLD PH	9	9	0	9	9	0	18	18	0	16	18	0
	FLD TEMPERATURE	9	9	0	9	9	0	18	18	0	18	18	0
	FLD TURBIDITY	9	9	0	9	9	0	18	18	0	18	18	0
*TOTAL SCAN CHEMISTRY (FLD)		27	27	0	52	52	0	108	107	0	107	102	0
CHEMISTRY (LAB)	ALKALINITY	9	9	0	9	9	0	17	17	0	17	17	0
	CALCIUM	9	9	0	9	9	0	18	18	0	17	17	0
	CYANIDE	9	0	1	9	0	2	9	1	1	9	0	3
	CHLORIDE	9	9	0	9	9	0	17	17	0	17	17	0
	COLOUR	9	9	0	9	9	0	17	17	0	17	17	0
	CONDUCTIVITY	9	9	0	9	9	0	17	17	0	17	17	0

TABLE 4

DRINKING WATER SURVEILLANCE PROGRAM CASSELMAN

SUMMARY TABLE OF RESULTS (1989)

		SITE											
		RAW			TREATED			SITE 1			SITE 2		
SCAN	PARAMETER	TOTAL	POSITIVE	TRACE	TOTAL	POSITIVE	TRACE	TOTAL	POSITIVE	TRACE	TOTAL	POSITIVE	TRACE
CHEMISTRY (LAB)	FLUORIDE	9	9	0	9	9	0	18	17	1	17	15	2
	HARDNESS	9	9	0	9	9	0	18	18	0	17	17	0
	IONCAL	9	9	0	9	9	0	18	17	0	18	17	0
	LANGELIERS INDEX	9	9	0	9	9	0	17	17	0	17	17	0
	MAGNESIUM	9	9	0	9	9	0	18	18	0	17	17	0
	SODIUM	9	9	0	9	9	0	18	18	0	17	17	0
	AMMONIUM TOTAL	9	5	2	9	4	4	18	12	3	17	12	3
	NITRITE	9	9	0	9	4	4	18	6	11	17	7	10
	TOTAL NITRATES	9	9	0	9	9	0	18	17	1	17	17	0
	NITROGEN TOT KJELD	9	8	0	9	9	0	17	17	0	17	17	0
	PH	9	9	0	9	9	0	17	17	0	17	17	0
	PHOSPHORUS FIL REACT	9	9	0	9	2	5	.	.	.	.	.	.
	PHOSPHORUS TOTAL	9	8	0	9	6	3	.	.	.	.	.	.
	SULPHATE	9	9	0	9	9	0	17	17	0	17	17	0
	TURBIDITY	9	9	0	9	9	0	17	17	0	17	17	0
*TOTAL SCAN CHEMISTRY (LAB)		189	174	3	189	160	18	324	295	17	316	289	18
METALS	SILVER	9	0	4	9	0	3	18	0	5	18	0	2
	ALUMINUM	9	9	0	9	9	0	18	18	0	18	18	0
	ARSENIC	9	5	4	9	2	7	18	2	16	18	2	15
	BARIUM	9	9	0	9	9	0	18	18	0	18	18	0
	BORON	9	8	1	9	9	0	18	18	0	18	18	0
	BERYLLIUM	9	0	7	9	0	8	18	0	14	18	0	11

TABLE 4

DRINKING WATER SURVEILLANCE PROGRAM CASSELMAN

SUMMARY TABLE OF RESULTS (1989)

		SITE											
		RAW			TREATED			SITE 1			SITE 2		
SCAN	PARAMETER	TOTAL	POSITIVE	TRACE	TOTAL	POSITIVE	TRACE	TOTAL	POSITIVE	TRACE	TOTAL	POSITIVE	TRACE
METALS	CADMIUM	9	0	2	9	0	1	18	1	7	18	0	4
	COBALT	9	0	7	9	0	6	18	0	12	18	0	14
	CHROMIUM	9	8	0	9	8	0	18	11	5	18	14	2
	COPPER	9	8	1	9	8	1	18	18	0	18	18	0
	IRON	9	9	0	9	1	6	18	2	13	18	2	16
	MERCURY	9	0	5	9	0	4	9	0	2	9	0	6
	MANGANESE	9	9	0	9	9	0	18	18	0	18	18	0
	MOLYBDENUM	9	9	0	9	9	0	18	18	0	18	18	0
	NICKEL	9	0	6	9	0	6	18	7	7	18	6	8
	LEAD	9	7	2	9	7	2	18	17	1	18	17	1
	ANTIMONY	9	8	1	9	9	0	18	18	0	18	18	0
	SELENIUM	9	0	6	9	3	5	18	4	12	18	2	15
	STRONTIUM	9	9	0	9	9	0	18	18	0	18	18	0
	TITANIUM	9	9	0	9	9	0	18	18	0	18	18	0
	THALLIUM	9	1	4	9	0	3	18	0	7	18	0	3
	URANIUM	9	9	0	9	9	0	18	18	0	18	18	0
	VANADIUM	9	9	0	9	9	0	18	18	0	18	18	0
	ZINC	9	9	0	9	9	0	18	18	0	18	18	0
*TOTAL SCAN METALS		216	135	50	216	128	52	423	260	101	423	259	97
*TOTAL GROUP INORGANIC & PHYSICAL		432	336	53	457	340	70	855	662	118	846	650	115
CHLOROAROMATICS	HEXACHLOROBUTADIENE	8	0	0	7	0	0	8	0	0	8	0	0
	123 TRICHLOROBENZENE	8	0	0	7	0	0	8	0	0	8	0	0

TABLE 4

DRINKING WATER SURVEILLANCE PROGRAM CASSELMAN

SUMMARY TABLE OF RESULTS (1989)

		SITE											
		RAW			TREATED			SITE 1			SITE 2		
SCAN	PARAMETER	TOTAL	POSITIVE	TRACE	TOTAL	POSITIVE	TRACE	TOTAL	POSITIVE	TRACE	TOTAL	POSITIVE	TRACE
CHLOROAROMATICS	1234 T-CHLOROBENZENE	8	0	0	7	0	0	8	0	0	8	0	0
	1235 T-CHLOROBENZENE	8	0	0	7	0	0	8	0	0	8	0	0
	124 TRICHLOROBENZENE	8	0	0	7	0	0	8	0	0	8	0	0
	1245 T-CHLOROBENZENE	8	0	0	7	0	0	8	0	0	8	0	0
	135 TRICHLOROBENZENE	8	0	0	7	0	0	8	0	0	8	0	0
	HCB	8	0	0	7	0	0	8	0	0	8	0	0
	HEXACHLOROETHANE	8	0	0	7	0	0	8	0	0	8	0	0
	OCTACHLOROSTYRENE	8	0	0	7	0	0	8	0	0	8	0	0
	PENTACHLOROBENZENE	8	0	0	7	0	0	8	0	0	8	0	0
	236 TRICHLOROTOLUENE	8	0	0	7	0	0	8	0	0	8	0	0
	245 TRICHLOROTOLUENE	8	0	0	7	0	0	8	0	0	8	0	0
	26A TRICHLOROTOLUENE	8	0	0	7	0	0	8	0	0	8	0	0
[illegible] CHLOROAROMATICS		112	0	0	98	0	0	112	0	0	112	0	0
CHLOROPHENOLS	234 TRICHLOROPHENOL	2	0	0	2	0	0	.	.	.	.	.	.
	2345 T-CHLOROPHENOL	2	0	0	2	0	0	.	.	.	.	.	.
	2356 T-CHLOROPHENOL	2	0	0	2	0	0	.	.	.	.	.	.
	245-TRICHLOROPHENOL	2	0	0	2	0	0	.	.	.	.	.	.
	246-TRICHLOROPHENOL	2	0	0	2	0	0	.	.	.	.	.	.
	PENTACHLOROPHENOL	2	0	0	2	0	0	.	.	.	.	.	.
*TOTAL SCAN CHLOROPHENOLS		12	0	0	12	0	0	0	0	0	0	0	0

TABLE 4

DRINKING WATER SURVEILLANCE PROGRAM CASSELMAN

SUMMARY TABLE OF RESULTS (1989)

		SITE											
		RAW			TREATED			SITE 1			SITE 2		
SCAN	PARAMETER	TOTAL	POSITIVE	TRACE	TOTAL	POSITIVE	TRACE	TOTAL	POSITIVE	TRACE	TOTAL	POSITIVE	TRACE
PAH	PHENANTHRENE	9	0	0	9	0	0	.	.	.	.	.	.
	ANTHRACENE	9	0	0	9	0	0	.	.	.	.	.	.
	FLUORANTHENE	9	0	0	9	0	0	.	.	.	.	.	.
	PYRENE	9	0	0	9	0	0	.	.	.	.	.	.
	BENZO(A)ANTHRACENE	9	0	0	9	0	0	.	.	.	.	.	.
	CHRYSENE	9	0	0	9	0	0	.	.	.	.	.	.
	DIMETH. BENZ(A)ANTHR	2	0	0	2	0	0	.	.	.	.	.	.
	BENZO(E) PYRENE	9	0	0	9	0	0	.	.	.	.	.	.
	BENZO(B) FLUORANTHEN	9	0	0	9	0	0	.	.	.	.	.	.
	PERYLENE	9	0	0	9	0	0	.	.	.	.	.	.
	BENZO(K) FLUORANTHEN	9	0	0	9	0	0	.	.	.	.	.	.
	BENZO(A) PYRENE	2	0	0	2	0	0	.	.	.	.	.	.
	BENZO(G,H,I) PERYLEN	9	0	0	9	0	0	.	.	.	.	.	.
	DIBENZO(A,H) ANTHRAC	9	0	0	9	0	0	.	.	.	.	.	.
	INDENO(1,2,3-C,D) PY	9	0	0	9	0	0	.	.	.	.	.	.
	BENZO(B) CHRYSENE	9	0	0	9	0	0	.	.	.	.	.	.
	CORONENE	9	0	0	9	0	0	.	.	.	.	.	.
*TOTAL SCAN PAH		139	0	0	139	0	0	0	0	0	0	0	0
PESTICIDES & PCB	ALDRIN	8	0	0	7	0	0	8	0	0	8	0	0
	ALPHA BHC	8	0	0	7	0	0	8	0	0	8	0	1
	BETA BHC	8	0	0	7	0	0	8	0	0	8	0	0
	LINDANE	8	0	1	7	0	1	8	0	0	8	0	1

TABLE 4

DRINKING WATER SURVEILLANCE PROGRAM CASSELMAN

SUMMARY TABLE OF RESULTS (1989)

		SITE											
		RAW			TREATED			SITE 1			SITE 2		
SCAN	PARAMETER	TOTAL	POSITIVE	TRACE	TOTAL	POSITIVE	TRACE	TOTAL	POSITIVE	TRACE	TOTAL	POSITIVE	TRACE
PESTICIDES & PCB	ALPHA CHLORDANE	8	0	0	7	0	0	8	0	0	8	0	0
	GAMMA CHLORDANE	8	0	0	7	0	0	8	0	0	8	0	0
	DIELDRIN	8	0	0	7	0	0	8	0	0	8	0	0
	METHOXYCHLOR	8	0	0	7	0	0	8	0	0	8	0	0
	ENDOSULFAN I	8	0	0	7	0	0	8	0	0	8	0	0
	ENDOSULFAN II	8	0	0	7	0	0	8	0	0	8	0	0
	ENDRIN	8	0	0	7	0	0	8	0	0	8	0	0
	ENDOSULFAN SULPHATE	8	0	0	7	0	0	8	0	0	8	0	0
	HEPTACHLOR EPOXIDE	8	0	0	7	0	0	8	0	0	8	0	0
	HEPTACHLOR	8	0	0	7	0	0	8	0	0	8	0	0
	MIREX	8	0	0	7	0	0	8	0	0	8	0	0
	OXYCHLORDANE	8	0	0	7	0	0	8	0	0	8	0	0
	OPDDT	8	0	0	7	0	0	8	0	0	8	0	0
	PCB	8	0	0	7	0	0	8	0	0	8	0	0
	DDD	8	0	0	7	0	0	8	0	0	8	0	0
	PPDDE	8	0	0	7	0	0	8	0	0	8	0	0
	PPDDT	8	0	0	7	0	0	8	0	0	8	0	0
	AMETRINE	9	0	0	9	0	0	4	0	0	4	0	0
	ATRAZINE	9	4	1	9	5	1	4	1	1	4	1	1
	ATRATONE	9	0	0	9	0	0	4	0	0	4	0	0
	CYANAZINE	8	0	2	9	0	3	4	0	1	4	0	1
	D-ETHYL ATRAZINE	9	0	5	9	0	6	4	0	2	4	0	2
	DES ETHYL SIMAZINE	9	0	0	9	0	0	4	0	0	4	0	0
	PROMETONE	9	0	0	9	0	0	4	0	0	4	0	0
	PROPAZINE	9	0	0	9	0	0	4	0	0	4	0	0

TABLE 4

DRINKING WATER SURVEILLANCE PROGRAM CASSELMAN

SUMMARY TABLE OF RESULTS (1989)

		SITE											
		RAW			TREATED			SITE 1			SITE 2		
SCAN	PARAMETER	TOTAL	POSITIVE	TRACE	TOTAL	POSITIVE	TRACE	TOTAL	POSITIVE	TRACE	TOTAL	POSITIVE	TRACE
PESTICIDES & PCB	PROMETRYNE	9	0	0	9	0	0	4	0	0	4	0	0
	METRIBUZIN (SENCOR)[4]	9	0	0	9	0	0	4	0	0	4	0	0
	SIMAZINE	9	0	0	9	0	0	4	0	0	4	0	0
	ALACHLOR	9	0	0	9	0	0	4	0	0	4	0	0
	METOLACHLOR	9	0	1	9	0	1	4	0	1	4	0	1
*TOTAL SCAN PESTICIDES & PCB		284	4	10	264	5	12	220	1	5	220	1	7
PHENOLICS	PHENOLICS	9	9	0	9	9	0	.	.	.	.	.	.
*TOTAL SCAN PHENOLICS		9	9	0	9	9	0	0	0	0	0	0	0
SPECIFIC PESTICIDES	TOXAPHENE	8	0	0	7	0	0	8	0	0	8	0	0
	2,4,5-T	2	0	0	2	0	0	.	.	.	.	.	.
	2,4-D	2	0	0	2	0	0	.	.	.	.	.	.
	2,4-DB	2	0	0	2	0	0	.	.	.	.	.	.
	2,4 D PROPIONIC ACID	2	0	0	2	0	0	.	.	.	.	.	.
	DICAMBA	2	0	0	2	0	0	.	.	.	.	.	.
	PICHLORAM	0	0	0	0	0	0	.	.	.	.	.	.
	SILVEX	2	0	0	2	0	0	.	.	.	.	.	.
	DIAZINON	2	0	0	2	0	0	.	.	.	.	.	.
	DICHLOROVOS	2	0	0	2	0	0	.	.	.	.	.	.
	CHLORPYRIFOS	2	0	0	2	0	0	.	.	.	.	.	.

TABLE 4

DRINKING WATER SURVEILLANCE PROGRAM CASSELMAN

SUMMARY TABLE OF RESULTS (1989)

		SITE											
		RAW			TREATED			SITE 1			SITE 2		
SCAN	PARAMETER	TOTAL	POSITIVE	TRACE	TOTAL	POSITIVE	TRACE	TOTAL	POSITIVE	TRACE	TOTAL	POSITIVE	TRACE
SPECIFIC PESTICIDES	ETHION	2	0	0	2	0	0	.	.	.	.	.	.
	AZINPHOS-METHYL	0	0	0	0	0	0	.	.	.	.	.	.
	MALATHION	2	0	0	2	0	0	.	.	.	.	.	.
	MEVINPHOS	2	0	0	2	0	0	.	.	.	.	.	.
	METHYL PARATHION	2	0	0	2	0	0	.	.	.	.	.	.
	METHYLTRITHION	2	0	0	2	0	0	.	.	.	.	.	.
	PARATHION	2	0	0	2	0	0	.	.	.	.	.	.
	PHORATE	2	0	0	2	0	0	.	.	.	.	.	.
	RELDAN	2	0	0	2	0	0	.	.	.	.	.	.
	RONNEL	2	0	0	2	0	0	.	.	.	.	.	.
	AMINOCARB	1	0	0	1	0	0	.	.	.	.	.	.
	BENOMYL	1	0	0	1	0	0	.	.	.	.	.	.
	BUX	0	0	0	0	0	0	.	.	.	.	.	.
	CARBOFURAN	2	0	0	2	0	0	.	.	.	.	.	.
	CICP	2	0	0	2	0	0	.	.	.	.	.	.
	DIALLATE	2	0	0	2	0	0	.	.	.	.	.	.
	EPTAM	1	0	0	1	0	0	.	.	.	.	.	.
	IPC	2	0	0	2	0	0	.	.	.	.	.	.
	PROPOXUR	2	0	0	2	0	0	.	.	.	.	.	.
	CARBARYL	2	0	0	2	0	0	.	.	.	.	.	.
	BUTYLATE	2	0	0	2	0	0	.	.	.	.	.	.
*TOTAL SCAN SPECIFIC PESTICIDES		61	0	0	60	0	0	8	0	0	8	0	0
VOLATILES	BENZENE	9	0	1	9	0	3	9	0	5	9	0	4

TABLE 4

DRINKING WATER SURVEILLANCE PROGRAM CASSELMAN

SUMMARY TABLE OF RESULTS (1989)

SCAN	PARAMETER	SITE RAW TOTAL	RAW POSITIVE	RAW TRACE	TREATED TOTAL	TREATED POSITIVE	TREATED TRACE	SITE 1 TOTAL	SITE 1 POSITIVE	SITE 1 TRACE	SITE 2 TOTAL	SITE 2 POSITIVE	SITE 2 TRACE
VOLATILES	TOLUENE	9	1	0	9	0	8	9	0	9	9	0	9
	ETHYLBENZENE	9	0	2	9	0	5	9	0	4	9	0	5
	P-XYLENE	9	0	0	9	0	0	9	0	0	9	0	0
	M-XYLENE	9	0	2	9	0	4	9	0	4	9	0	3
	O-XYLENE	9	0	2	9	0	8	9	0	6	9	0	5
	STYRENE	9	0	1	9	0	7	9	0	6	9	0	5
	1,1 DICHLOROETHYLENE	9	0	0	9	0	0	9	0	0	9	0	0
	METHYLENE CHLORIDE	9	0	0	9	0	0	9	0	0	9	0	0
	T1,2DICHLOROETHYLENE	9	0	0	9	0	0	9	0	0	9	0	0
	1,1 DICHLOROETHANE	9	0	0	9	0	0	9	0	0	9	0	0
	CHLOROFORM	9	5	4	9	9	0	9	9	0	9	9	0
	111, TRICHLOROETHANE	9	0	2	9	0	0	9	0	1	9	0	1
	1,2 DICHLOROETHANE	9	0	0	9	0	0	9	0	0	9	0	0
	CARBON TETRACHLORIDE	9	0	0	9	0	0	9	0	0	9	0	0
	1,2 DICHLOROPROPANE	9	0	0	9	0	0	9	0	0	9	0	0
	TRICHLOROETHYLENE	9	0	0	9	0	0	9	0	0	9	0	0
	DICHLOROBROMOMETHANE	9	0	4	9	8	1	9	9	0	9	9	0
	112 TRICHLOROETHANE	9	0	0	9	0	0	9	0	0	9	0	0
	CHLORODIBROMOMETHANE	9	0	0	9	5	3	9	5	2	9	4	3
	T-CHLOROETHYLENE	9	0	0	9	0	0	9	0	0	9	0	1
	BROMOFORM	9	0	0	9	0	0	9	0	2	9	0	1
	1122 T-CHLOROETHANE	9	0	0	9	0	0	9	0	0	9	0	0
	CHLOROBENZENE	9	0	0	9	0	0	9	0	0	9	0	0
	1,4 DICHLOROBENZENE	9	0	0	9	0	0	9	0	0	9	0	0
	1,3 DICHLOROBENZENE	9	0	0	9	0	0	9	0	0	9	0	0

TABLE 4

DRINKING WATER SURVEILLANCE PROGRAM CASSELMAN

SUMMARY TABLE OF RESULTS (1989)

		SITE											
		RAW			TREATED			SITE 1			SITE 2		
SCAN	PARAMETER	TOTAL	POSITIVE	TRACE	TOTAL	POSITIVE	TRACE	TOTAL	POSITIVE	TRACE	TOTAL	POSITIVE	TRACE
VOLATILES	1,2 DICHLOROBENZENE	9	0	0	9	0	0	9	0	0	9	0	0
	ETHLYENE DIBROMIDE	9	0	0	9	0	0	9	0	0	9	0	0
	TOTL TRIHALOMETHANES	9	1	5	9	9	0	9	9	0	9	9	0
*TOTAL SCAN VOLATILES		261	7	23	261	31	39	261	32	39	261	31	37
*TOTAL GROUP ORGANIC		878	20	33	843	45	51	601	33	44	601	32	44
TOTAL		1337	381	86	1327	393	121	1483	710	162	1474	696	159

KEY TO TABLE 5 and 6

A ONTARIO DRINKING WATER OBJECTIVES (ODWO)
1. Maximum Acceptable Concentration (MAC)
1+. MAC for Total Trihalomethanes
1*. MAC for Bacteriological Analyses
Poor water quality is indicated when :
- total coliform counts > 0 < 5
- P/A Bottle Test is present after 48 hours
- Aeromonas organisms are detected in more than 25% of samples in a single submission or in successive submissions from the same sampling site
- Pseudomonas Aeruginosa, Staphylococcus Aureus and members of the Fecal Streptococcus group should not be detected in any sample
- Standard Plate Count should not exceed 500 organisms per ml at 35 ^{0}C within 48 hours

2. Interim Maximum Acceptable Concentration (IMAC)
3. Maximum Desirable Concentration (MDC)
4. Aesthetic or Recommended Operational Guideline
- hardness levels between 80 and 100 mg/L as calcium carbonate are considered to provide an acceptable balance between corrosion and incrustation, water supplies with a hardness >200 mg/L are considered poor and those in excess of 500 mg/L are unacceptable.

B HEALTH & WELFARE CANADA (H&W)
1. Maximum Acceptable Concentration (MAC)
2. Proposed MAC
3. Interim MAC
4. Aesthetic Objective (AO) (for xylenes, the AO is a total)

C WORLD HEALTH ORGANIZATION (WHO)
1. Guideline Value (GV)
2. Tentative GV
3. Aesthetic GV

D US ENVIRONMENTAL PROTECTION AGENCY (EPA)
1. Maximum Contaminant Level (MCL)
2. Suggested No-Adverse Effect Level (SNAEL)
3. Lifetime Health Advisory
4. EPA Ambient Water Quality Criteria

F EUROPEAN ECONOMIC COMMUNITY (EEC)
1. Health Related Guideline Level
2. Aesthetic Guideline Level
3. Maximum Admissable Concentration (MADC)

G CALIFORNIA STATE DEPARTMENT OF HEALTH-GUIDELINE VALUE

H USSR MAXIMUM PERMISSIBLE CONCENTRATION

I NEW YORK STATE AMBIENT WATER GUIDELINE

N/A NONE AVAILABLE

INTERPRETATION OF DATA

The interpretation of analytical results that are obtained from measurements near the limit of detection of the measurement process is subject to greater uncertainty than those at higher concentrations. The principle areas of concern relate to whether the substance has actually been detected, whether it has been properly identified, and whether it is an artifact of the measurement process. In other words, false positives can be caused by the instrumentation or the test procedures used, when in fact these compounds are not present in the sample.

There are several methods to treat data from such measurements:
1. Exclude the low-level data because of this uncertainty factor. However, studies of long-term environmental trends and modelling may be adversely affected by exclusion of such data.
2. Qualify these data so the user is aware of the greater uncertainty associated with their use.

For the Drinking Water Surveillance Program, measurements near the limit of detection of the measurement process are reported qualified by the code "<T". Results quantified by "W" indicate a zero measurement. These results are reported for purposes of modelling and long-term trend analysis and no significance should be attributed to a single determination of a substance below "T" (a single determination may well be a false positive). Repeat analysis or additional data are needed before it can be stated with certainty that the substance in question was truly present. On the other hand, it is less likely that repeated detection of a substance at or near the limit of detection at a specific location is solely due to an artifact in the measurement system, and more likely represents a true positive. However the average of such data is still only an estimate of the amount of substance present subject to the possible biases of the method used.

LABORATORY RESULTS, REMARK DESCRIPTIONS

.	No Sample Taken
BDL	Below Minimum Measurable Amount
<T	Greater Than Detection Limit But Not Confident (SEE INTERPRETATION OF RESULTS ABOVE)
>	Results Are Greater Than The Upper Limit
<=>	Approximate Result
!CS	No Data: Contamination Suspected
!IL	No Data: Sample Incorrectly Labelled
!IS	No Data: Insufficient Sample
!IV	No Data: Inverted Septum
!LA	No Data: Laboratory Accident
!LD	No Data: Test Queued After Sample Discarded

!NA	No Data: No Authorization To Perform Reanalysis
!NP	No Data: No Procedure
!NR	No Data: Sample Not Received
!OP	No Data: Obscured Plate
!QU	No Data: Quality Control Unacceptable
!RE	No Data: Received Empty
!RO	No Data: See Attached Report (no numeric results)
!SM	No Data: Sample Missing
!SS	No Data: Send Separate Sample Properly Preserved
!UI	No Data: Indeterminant Interference
!TX	No Data: Time Expired
A3C	Approximate, Total Count Exceeded 300 Colonies
APL	Additional Peak, Large, Not Priority Pollutant
APS	Additional Peak, Less Than, Not Priority Pollutant
CIC	Possible Contamination, Improper Cap
CRO	Calculated Result Only
PPS	Test Performed On Preserved Sample
RMP	P and M-Xylene Not Separated
RRV	Rerun Verification
RVU	Reported Value Unusual
SPS	Several Peaks, Small, Not Priority Pollutant
UAL	Unreliable: Sample Age Exceeds Normal Limit
UCR	Unreliable: Could Not Confirm By Reanalysis
UCS	Unreliable: Contamination Suspected
UIN	Unreliable: Indeterminant Interference
XP	Positive After X Number of Hours
T# (T06)	Result Taken After # Hours

TABLE 5

DRINKING WATER SURVEILLANCE PROGRAM CASSELMAN WTP 1989

	WATER TREATMENT PLANT		DISTRIBUTION SYSTEM			
	RAW	TREATED	SITE 1		SITE 2	
			STANDING	FREE FLOW	STANDING	FREE FLOW
BACTERIOLOGICAL						
FECAL COLIFORM MF (CT/100ML)			DET'N LIMIT = 0		GUIDELINE = 0 (A1)	
APR	20	.	.	.	.	.
MAY	184	.	.	.	.	.
JUN	16	.	.	.	.	.
JUL	12 A3C	.	.	.	.	.
AUG	48	.	.	.	.	.
SEP	8	.	.	.	.	.
OCT	4	.	.	.	.	.
NOV	36	.	.	.	.	.
DEC	128	.	.	.	.	.
STANDRD PLATE CNT MF ( )			DET'N LIMIT = 0		GUIDELINE = 500/ML (A1)	
APR	.	250	.	230	.	210
MAY	.	230	.	330	.	790
JUN	.	530	.	3200	.	1250
JUL	.	59	.	11400	.	24000 >
AUG	.	210	.	123	.	450
SEP	.	14	.	20	.	510
OCT	.	9 <=>	.	3 <=>	.	2400 >
NOV	.	17	.	14	.	860
DEC	.	6 <=>	.	5 <=>	.	21
TOTAL COLIFORM MF (CT/100ML)			DET'N LIMIT = 0		GUIDELINE = 5/100ML(A1)	
APR	14900 A3C	0	.	0	.	0
MAY	18000	0	.	10	.	0
JUN	100 <=>	0	.	BDL	.	0
JUL	37000 A3C	0	.	0 A3C	.	0
AUG	BDL	0	.	0	.	0
SEP	200 A3C	0	.	1 A3C	.	0
OCT	420 A3C	0	.	0	.	0
NOV	1800	0	.	0	.	0
DEC	12100 A3C	0	.	0	.	0
T COLIFORM BCKGRD MF (CT/100ML)			DET'N LIMIT = 0		GUIDELINE = N/A	
APR	70000 A3C	0	.	0	.	0
MAY	87000	6	.	58	.	4
JUN	40000 >	0	.	2400 >	.	6
JUL	60000 A3C	0	.	2400 >	.	19
AUG	40000 >	0	.	37	.	70
SEP	28800 A3C	0	.	660 A3C	.	0
OCT	28000 A3C	0	.	0	.	0
NOV	27000	0	.	7	.	4
DEC	28000 A3C	0	.	0	.	0

TABLE 5

DRINKING WATER SURVEILLANCE PROGRAM CASSELMAN WTP 1989

	WATER TREATMENT PLANT		DISTRIBUTION SYSTEM			
	RAW	TREATED	SITE 1		SITE 2	
			STANDING	FREE FLOW	STANDING	FREE FLOW
CHEMISTRY (FLD)						
FLD CHLORINE (COMB) ( )			DET'N LIMIT = N/A		GUIDELINE = N/A	
APR	.	.400	.400	.400	.100	.200
MAY	.	.300	.200	.200	.	.100
JUN	.	.200	.200	.200	.100	.100
JUL	.	.600	.600	.600	.100	.200
AUG	.	.700	.400	.400	.400	.500
SEP	.	.600	.500	.400	.500	.500
OCT	.	.500	.600	.700	.100	.200
NOV	.	.400	.100	.200	.100	.100
DEC	.	.300	.250	.400	.200	.200
FLD CHLORINE FREE ( )			DET'N LIMIT = N/A		GUIDELINE = N/A	
APR	.	.	.100	.100	.100	.200
MAY	.	.	.100	.100	.100	.100
JUN	.	.100	.100	.100	.100	.100
JUL	.	.200	.100	.100	.000	.100
AUG	.	1.200	.600	.900	.000	.000
SEP	.	.500	.600	.900	.000	.300
OCT	.	.600	.100	.200	.100	.200
NOV	.	.200	.000	.100	.000	.100
DEC	.	.500	.050	.100	.100	.200
FLD CHLORINE (TOTAL) ( )			DET'N LIMIT = N/A		GUIDELINE = N/A	
APR	.	.400	.500	.500	.200	.400
MAY	.	.300	.300	.300	.100	.200
JUN	.	.300	.300	.300	.200	.200
JUL	.	.800	.700	.700	.100	.300
AUG	.	1.900	1.000	1.300	.400	.500
SEP	.	1.100	1.100	1.300	.500	.800
OCT	.	1.100	.700	.900	.200	.400
NOV	.	.600	.100	.300	.100	.200
DEC	.	.800	.300	.500	.300	.400
FLD PH (DMNSLESS)			DET'N LIMIT = N/A		GUIDELINE = 6.5-8.5(A4)	
APR	7.600	6.800	6.900	6.800	7.100	6.900
MAY	7.700	7.300	7.200	7.100	7.300	7.100
JUN	8.000	7.300	7.300	7.200	7.300	7.300
JUL	8.200	7.200	7.000	7.000	7.300	7.100
AUG	8.100	7.100	7.100	7.000	7.300	7.300
SEP	7.900	7.100	6.900	6.900	7.300	7.300
OCT	8.000	7.000	6.900	6.800	7.300	7.100
NOV	7.700	7.000	7.300	7.100	7.300	7.100
DEC	7.900	7.300	7.300	6.900	7.300	7.300
FLD TEMPERATURE (DEG.C)			DET'N LIMIT = N/A		GUIDELINE = 15 (A1)	
APR	2.000	2.000	7.000	4.000	12.000	7.000

TABLE 5

DRINKING WATER SURVEILLANCE PROGRAM CASSELMAN WTP 1989

	WATER TREATMENT PLANT		DISTRIBUTION SYSTEM			
	RAW	TREATED	SITE 1		SITE 2	
			STANDING	FREE FLOW	STANDING	FREE FLOW
MAY	9.000	10.000	11.000	9.000	14.000	7.000
JUN	19.000	19.000	15.000	14.000	14.000	12.000
JUL	24.000	24.000	22.000	22.000	20.000	17.000
AUG	24.000	24.000	19.000	23.000	21.000	20.000
SEP	21.000	21.000	19.000	18.000	20.000	20.000
OCT	16.000	16.000	17.000	15.000	20.000	18.000
NOV	9.000	9.000	17.000	10.000	17.000	13.000
DEC	2.000	2.000	10.000	2.000	18.000	8.000
FLD TURBIDITY (FTU)			DET'N LIMIT = N/A		GUIDELINE = 1.0 (A1)	
APR	24.000	1.600	1.600	1.600	1.600	1.400
MAY	14.000	1.400	.900	.900	.700	.800
JUN	9.200	.740	.740	.740	.760	.740
JUL	3.600	.740	.600	.600	.680	.640
AUG	3.000	.400	.280	.680	.400	.380
SEP	3.100	.340	.300	.400	.300	.280
OCT	9.400	1.400	1.400	1.400	1.000	1.000
NOV	6.600	.500	.600	.900	.440	.480
DEC	3.800	.240	.300	.340	.380	.440

TABLE 5

DRINKING WATER SURVEILLANCE PROGRAM CASSELMAN WTP 1989

	WATER TREATMENT PLANT		DISTRIBUTION SYSTEM			
	RAW	TREATED	SITE 1		SITE 2	
			STANDING	FREE FLOW	STANDING	FREE FLOW
CHEMISTRY (LAB)						
ALKALINITY (MG/L)			DET'N LIMIT = .200		GUIDELINE = 30-500 (A4)	
APR	109.100	77.300	76.400	77.100	74.400	75.100
MAY	188.200	164.000	166.300	162.600	173.100	IIS
JUN	237.100	192.800	191.900	191.300	193.000	191.800
JUL	231.100	175.600	177.900	178.200	174.400	177.000
AUG	204.600	153.400	154.700	153.400	155.400	153.900
SEP	211.300	160.400	160.700	160.500	161.900	161.400
OCT	207.600	159.200	159.300	159.400	160.600	159.700
NOV	216.700	160.900	159.500	159.800	158.300	158.600
DEC	258.300	221.200	IIS	212.800	211.800	212.600
CALCIUM (MG/L)			DET'N LIMIT = .100		GUIDELINE = 100 (F2)	
APR	42.000	38.000	38.200	38.600	36.000	36.800
MAY	65.800	70.200	70.800	68.600	70.600	IIS
JUN	76.400	75.800	76.800	77.400	77.400	75.800
JUL	79.000	78.800	78.400	78.000	76.800	78.400
AUG	64.600	61.800	61.600	63.600	62.800	62.000
SEP	62.800	61.200	62.000	63.800	62.800	60.200
OCT	60.200	60.400	60.400	61.000	60.400	60.200
NOV	78.800	75.800	76.200	75.800	72.300	71.100
DEC	100.000	97.600	98.400	98.600	97.200	97.400
CYANIDE (MG/L)			DET'N LIMIT = 0.001		GUIDELINE = .200 (A1)	
APR	BDL	.002 <T	.	.002 <T	.	.003 <T
MAY	BDL	BDL	.	BDL	.	BDL
JUN	BDL	BDL	.	BDL	.	BDL
JUL	BDL	BDL	.	BDL	.	BDL
AUG	BDL	BDL	.	BDL	.	BDL
SEP	BDL	BDL	.	BDL	.	BDL
OCT	BDL	BDL	.	BDL	.	.002 <T
NOV	BDL	BDL	.	BDL	.	BDL
DEC	.002 <T	.002 <T	.	.015	.	.003 <T
CHLORIDE (MG/L)			DET'N LIMIT = .200		GUIDELINE = 250 (A3)	
APR	14.600	17.700	17.500	17.600	16.100	16.500
MAY	18.500	29.600	30.100	29.200	30.700	.
JUN	25.800	27.300	27.700	27.200	28.100	28.000
JUL	22.800	35.700	35.700	35.100	32.400	33.900
AUG	24.400	37.400	38.000	37.300	38.300	38.200
SEP	27.800	38.000	38.200	38.000	38.000	37.800
OCT	33.300	39.500	40.100	39.500	40.500	39.800
NOV	32.600	37.400	38.600	38.400	39.100	38.900
DEC	55.900	55.500	IIR	55.400	54.200	54.600
COLOUR (HZU)			DET'N LIMIT = .5		GUIDELINE = 5.0 (A3)	
APR	49.500	12.500	14.000	13.500	13.500	13.000

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DRINKING WATER SURVEILLANCE PROGRAM CASSELMAN WTP 1989

	WATER TREATMENT PLANT		DISTRIBUTION SYSTEM			
	RAW	TREATED	SITE 1		SITE 2	
			STANDING	FREE FLOW	STANDING	FREE FLOW
MAY	55.500	16.500	17.500	16.000	18.000	IIS
JUN	48.500	18.500	22.500	18.000	19.500	18.500
JUL	59.500	17.500	20.000	19.500	20.000	19.500
AUG	48.000	7.500	8.500	8.000	9.500	8.500
SEP	45.500	10.000	11.000	11.000	12.500	12.000
OCT	36.500	9.000	11.000	8.500	11.000	10.500
NOV	36.500	8.000	9.000	8.500	9.000	8.000
DEC	33.500	9.000	IIS	9.500	10.000	9.500
CONDUCTIVITY (UMHO/CM)			DET'N LIMIT = 1		GUIDELINE = 400 (F2)	
APR	311	338	334	338	322	325
MAY	492	554	556	551	575	IIS
JUN	586	589	590	587	594	593
JUL	565	593	592	588	582	587
AUG	532	562	564	561	567	565
SEP	532	555	558	558	557	555
OCT	556	576	577	579	579	575
NOV	646	658	660	662	659	662
DEC	853	847	IIS	840	836	839
FLUORIDE (MG/L)			DET'N LIMIT = .01		GUIDELINE = 2.400 (A1)	
APR	.120	.060	.040 <T	.060	.040 <T	.040 <T
MAY	.140	.080	.060	.060	.080	IIS
JUN	.140	.080	.100	.080	.100	.080
JUL	.140	.100	.100	.100	.100	.100
AUG	.140	.080	.100	.100	.100	.100
SEP	.160	.120	.100	.120	.100	.120
OCT	.180	.100	.100	.100	.100	.100
NOV	.180	.080	.100	.100	.100	.080
DEC	.120	.080	.080	.080	.080	.080
HARDNESS (MG/L)			DET'N LIMIT = .500		GUIDELINE = 80-100 (A4)	
APR	141.000	131.000	131.000	133.000	123.000	126.000
MAY	236.000	248.000	250.000	244.000	252.000	IIS
JUN	285.000	277.000	281.000	282.000	285.000	279.000
JUL	287.000	287.000	285.000	283.000	278.000	285.000
AUG	253.000	246.000	248.000	253.000	250.000	249.000
SEP	248.000	243.000	244.000	251.000	250.000	242.000
OCT	244.000	243.000	243.000	244.000	244.000	245.000
NOV	297.000	289.000	290.000	288.000	278.000	274.100
DEC	384.000	376.000	379.000	379.000	372.000	375.000
IONCAL (DMNSLESS)			DET'N LIMIT = N/A		GUIDELINE = N/A	
APR	4.118	.485	.568	.482	.175	.402
MAY	.526	2.799	3.030	4.039	4.394	.000 NAF
JUN	.044	.568	.567	1.456	1.520	.474

TABLE 5

DRINKING WATER SURVEILLANCE PROGRAM CASSELMAN WTP 1989

	WATER TREATMENT PLANT		DISTRIBUTION SYSTEM			
	RAW	TREATED	SITE 1		SITE 2	
			STANDING	FREE FLOW	STANDING	FREE FLOW
JUL	2.927	3.508	2.408	1.433	.811	2.380
AUG	.866	3.633	2.464	.475	2.827	2.834
SEP	.252	2.433	2.515	.152	.540	3.592
OCT	1.175	1.572	1.824	.944	1.695	.155
NOV	2.923	3.924	3.908	4.066	8.123	9.420
DEC	1.831	1.726	.000 NAF	1.625	.380	.171
LANGELIERS INDEX (DMNSLESS)			DET'N LIMIT = N/A		GUIDELINE = N/A	
APR	.319	.153	.111	.109	.034	.078
MAY	1.193	1.025	1.045	.982	1.099	.
JUN	1.309	.825	1.019	.991	1.014	1.013
JUL	.994	.621	.685	.684	.648	.673
AUG	.917	.730	.692	.912	.722	.782
SEP	1.099	.866	.802	.894	.851	.811
OCT	1.051	.855	.845	.689	.848	.975
NOV	1.129	.812	.880	.849	.954	.698
DEC	1.388	1.341	.	1.369	1.201	1.283
MAGNESIUM (MG/L)			DET'N LIMIT = .050		GUIDELINE = 30 (F2)	
APR	8.800	8.800	8.700	8.900	8.100	8.300
MAY	17.300	17.700	17.900	17.600	18.400	IIS
JUN	22.800	21.400	21.700	21.400	22.300	21.700
JUL	21.700	21.900	21.600	21.400	20.900	21.600
AUG	22.300	22.200	22.900	22.800	22.500	22.800
SEP	22.300	21.800	21.500	22.300	22.700	22.200
OCT	22.700	22.500	22.300	22.300	22.600	23.000
NOV	24.400	24.200	24.200	24.100	23.650	23.450
DEC	32.700	32.200	32.200	32.200	31.500	32.100
SODIUM (MG/L)			DET'N LIMIT = .200		GUIDELINE = 200 (C3)	
APR	7.200	12.600	12.600	12.600	13.000	13.000
MAY	11.200	13.600	13.800	13.200	15.000	IIS
JUN	17.400	15.800	15.800	16.000	16.400	16.000
JUL	15.200	15.200	15.800	15.000	14.600	14.800
AUG	17.000	17.800	18.600	18.200	18.200	18.000
SEP	18.600	18.800	18.600	18.400	18.600	18.400
OCT	22.200	21.600	22.200	22.000	22.600	23.400
NOV	19.600	20.200	20.800	21.100	20.000	20.100
DEC	36.000	33.000	33.000	33.200	31.400	31.800
AMMONIUM TOTAL (MG/L)			DET'N LIMIT = 0.002		GUIDELINE = .05 (F2)	
APR	.260	.344	.348	.336	.302	.314
MAY	BDL	.054	.050	.056	.020	IIS
JUN	BDL	.018	.020	.014	.016	.018
JUL	.002 <T	.016	.016	.020	.058	.036
AUG	.180	.002 <T	.018	.012	.024	.014

TABLE 5

DRINKING WATER SURVEILLANCE PROGRAM CASSELMAN WTP 1989

	WATER TREATMENT PLANT		DISTRIBUTION SYSTEM			
	RAW	TREATED	SITE 1		SITE 2	
			STANDING	FREE FLOW	STANDING	FREE FLOW
SEP	.116	.008 <T	BDL	.010	.018	.008 <T
OCT	.032	.004 <T	.012	.008 <T	.008 <T	.006 <T
NOV	.004 <T	.004 <T	.004 <T	.006 <T	.012	.010
DEC	.024	BDL	BDL	BDL	BDL	BDL
NITRITE (MG/L)			DET'N LIMIT = 0.001		GUIDELINE = 1.000 (A1)	
APR	.015	.015	.006	.006	.006	.006
MAY	.083	.003 <T	.004 <T	.003 <T	.004 <T	IIS
JUN	.047	.007	.005	.007	.005	.005
JUL	.158	.002 <T	.002 <T	.001 <T	.005	.003 <T
AUG	.099	BDL	.003 <T	.003 <T	.004 <T	.002 <T
SEP	.024	.005	.007	.005	.006	.006
OCT	.066	.002 <T	.003 <T	.003 <T	.003 <T	.003 <T
NOV	.124	.006	.002 <T	.001 <T	.002 <T	.001 <T
DEC	.026	.002 <T	BDL	.001 <T	.002 <T	.001 <T
TOTAL NITRATES (MG/L)			DET'N LIMIT = .020		GUIDELINE = 10.000 (A1)	
APR	1.490	1.090	1.040	1.050	.955	.960
MAY	2.560	2.330	2.260	2.400	1.970	IIS
JUN	.475	.385	.390	.390	.390	.395
JUL	1.970	1.870	1.880	1.860	2.110	1.930
AUG	1.210	1.250	1.310	1.310	1.210	1.220
SEP	.095	.140	.130	.145	.135	.130
OCT	.090	.055	.065	.050	.060	.055
NOV	3.020	3.050	2.960	2.880	2.930	2.850
DEC	2.960	3.010	.005 <T	2.960	3.020	2.940
NITROGEN TOT KJELD (MG/L)			DET'N LIMIT = .020		GUIDELINE = N/A	
APR	1.740	1.170	1.180	1.180	1.070	1.090
MAY	1.030	.800	.800	.830	.820	ISM
JUN	.990	.750	.730	.730	.760	.730
JUL	1.270	.950	1.000	.940	.910	1.020
AUG	1.330	.670	.690	.680	.770	.720
SEP	1.100	.720	.740	.720	.790	.740
OCT	.960	.650	.650	.660	.700	.660
NOV	BDL	.590	.530	.540	.570	.560
DEC	.800	.710	IIS	.590	.610	.550
PH (DMNSLESS)			DET'N LIMIT = N/A		GUIDELINE = 6.5-8.5(A4)	
APR	8.100	8.130	8.090	8.080	8.050	8.080
MAY	8.560	8.430	8.440	8.400	8.480	IIS
JUN	8.520	8.130	8.320	8.290	8.310	8.320
JUL	8.200	7.950	8.010	8.010	7.990	8.000
AUG	8.260	8.220	8.180	8.390	8.200	8.270
SEP	8.440	8.340	8.270	8.350	8.310	8.290
OCT	8.420	8.340	8.330	8.170	8.330	8.460

TABLE 5

DRINKING WATER SURVEILLANCE PROGRAM CASSELMAN WTP 1989

	WATER TREATMENT PLANT		DISTRIBUTION SYSTEM			
	RAW	TREATED	SITE 1		SITE 2	
			STANDING	FREE FLOW	STANDING	FREE FLOW
NOV	8.370	8.200	8.270	8.240	8.370	8.120
DEC	8.460	8.490	IIS	8.530	8.370	8.450
PHOSPHORUS FIL REACT (MG/L)			DET'N LIMIT = .0005		GUIDELINE = N/A	
APR	.080	.005	.	.	.	.
MAY	.026	.001 <T	.	.	.	.
JUN	.029	.001 <T	.	.	.	.
JUL	.015	.002 <T	.	.	.	.
AUG	.036	BDL	.	.	.	.
SEP	.067	.003	.	.	.	.
OCT	.045	.002 <T	.	.	.	.
NOV	.057	.002 <T	.	.	.	.
DEC	.018	BDL	.	.	.	.
PHOSPHORUS TOTAL (MG/L)			DET'N LIMIT = .002		GUIDELINE = .40 (F2)	
APR	.185	.035	.	.	.	.
MAY	.072	.013	.	.	.	.
JUN	.078	.016	.	.	.	.
JUL	.044	.016	.	.	.	.
AUG	.085	.009 <T	.	.	.	.
SEP	.106	.016	.	.	.	.
OCT	.091	.016	.	.	.	.
NOV	BDL	.009 <T	.	.	.	.
DEC	.043	.003 <T	.	.	.	.
SULPHATE (MG/L)			DET'N LIMIT = .200		GUIDELINE = 500. (A3)	
APR	15.730	52.130	51.930	52.920	50.200	50.860
MAY	33.530	68.650	69.330	68.350	70.720	IIS
JUN	45.410	77.610	78.060	77.320	78.610	78.880
JUL	38.620	73.460	73.530	73.640	76.420	74.770
AUG	43.040	80.710	79.370	79.570	80.130	80.460
SEP	37.690	72.750	72.760	72.970	73.230	73.550
OCT	38.990	76.610	76.870	76.230	76.780	77.010
NOV	73.180	116.440	118.700	118.720	118.580	119.100
DEC	102.290	139.590	IIS	136.410	134.280	139.240
TURBIDITY (FTU)			DET'N LIMIT = .02		GUIDELINE = 1.00 (A1)	
APR	46.000	4.000	3.650	3.600	4.000	3.800
MAY	30.000	.930	1.220 RRV	1.460 RRV	1.030 RRV	IIS
JUN	22.000	.870	.690	.940	.960	.950
JUL	8.600	.950	.990	.970	.900	.970
AUG	6.600	.810	.870	.860	.810	.630
SEP	9.200	.850	.800	.750	.800	.700
OCT	10.200	.850	.950	.800	1.000	.950
NOV	8.600	.610	.690	.590	.650	.510
DEC	8.300	.240	IIS	.500	.440	.320

TABLE 5

DRINKING WATER SURVEILLANCE PROGRAM CASSELMAN WTP 1989

	WATER TREATMENT PLANT		DISTRIBUTION SYSTEM			
	RAW	TREATED	SITE 1		SITE 2	
			STANDING	FREE FLOW	STANDING	FREE FLOW
METALS						
SILVER (UG/L)				DET'N LIMIT = .020	GUIDELINE = 50. (A1)	
APR	.090 <T	BDL	BDL	BDL	BDL	BDL
MAY	.080 <T	BDL	.060 <T	BDL	.040 <T	BDL
JUN	BDL	BDL	.070 <T	BDL	.030 <T	BDL
JUL	.060 <T	.060 <T	BDL	BDL	BDL	BDL
AUG	BDL	BDL	BDL	BDL	BDL	BDL
SEP	.070 <T	.030 <T	.060 <T	BDL	BDL	BDL
OCT	BDL	BDL	BDL	BDL	BDL	BDL
NOV	BDL	.030 <T	.030 <T	.030 <T	BDL	BDL
DEC	BDL	BDL	BDL	BDL	BDL	BDL
ALUMINUM (UG/L)				DET'N LIMIT = .050	GUIDELINE = 100.(A4)	
APR	661.200	498.800	475.600	487.200	464.000	464.000
MAY	522.000	371.200	336.400	394.400	336.400	348.000
JUN	320.000	390.000	410.000	420.000	370.000	360.000
JUL	210.000	380.000	410.000	390.000	330.000	360.000
AUG	180.000	150.000	140.000	140.000	150.000	150.000
SEP	210.000	310.000	300.000	300.000	270.000	280.000
OCT	360.000	470.000	390.000	430.000	400.000	410.000
NOV	210.000	200.000	160.000	180.000	160.000	160.000
DEC	180.000	66.000	65.000	66.000	72.000	75.000
ARSENIC (UG/L)				DET'N LIMIT = 0.050	GUIDELINE = 50.0 (A1)	
APR	.750 <T	.480 <T	.520 <T	.300 <T	.400 <T	.320 <T
MAY	.430 <T	.190 <T	.100 <T	.150 <T	.280 <T	BDL
JUN	1.400	.850 <T	1.000 <T	.910 <T	.700 <T	.970 <T
JUL	1.100	.280 <T	.180 <T	.260 <T	.320 <T	.230 <T
AUG	1.900	1.300	.730 <T	1.000 <T	.870 <T	.910 <T
SEP	2.200	1.400	1.400	1.200	1.100	1.100
OCT	1.300	.600 <T	.590 <T	.340 <T	.600 <T	.680 <T
NOV	.690 <T	.210 <T	.270 <T	.310 <T	.280 <T	.250 <T
DEC	.610 <T	.450 <T	.400 <T	.440 <T	.360 <T	.330 <T
BARIUM (UG/L)				DET'N LIMIT = 0.020	GUIDELINE = 1000. (A1)	
APR	47.000	37.000	37.000	37.000	35.000	35.000
MAY	52.000	47.000	46.000	48.000	49.000	48.000
JUN	66.000	52.000	54.000	53.000	53.000	52.000
JUL	57.000	52.000	52.000	51.000	50.000	50.000
AUG	58.000	54.000	50.000	54.000	50.000	52.000
SEP	50.000	45.000	46.000	45.000	47.000	46.000
OCT	53.000	48.000	46.000	45.000	47.000	47.000
NOV	63.000	53.000	53.000	51.000	52.000	53.000
DEC	91.000	57.000	57.000	56.000	53.000	56.000
BORON (UG/L)				DET'N LIMIT = 0.200	GUIDELINE = 5000. (A1)	
APR	16.000 <T	140.000	71.000	21.000	63.000	88.000

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DRINKING WATER SURVEILLANCE PROGRAM CASSELMAN WTP 1989

	WATER TREATMENT PLANT		DISTRIBUTION SYSTEM			
	RAW	TREATED	SITE 1		SITE 2	
			STANDING	FREE FLOW	STANDING	FREE FLOW
MAY	52.000	120.000	22.000	210.000	230.000	140.000
JUN	51.000	57.000	42.000	40.000	36.000	57.000
JUL	50.000	70.000	49.000	67.000	68.000	69.000
AUG	98.000	98.000	58.000	94.000	51.000	95.000
SEP	76.000	88.000	88.000	85.000	83.000	80.000
OCT	51.000	64.000	51.000	50.000	63.000	66.000
NOV	47.000	48.000	37.000	36.000	43.000	39.000
DEC	46.000	44.000	44.000	44.000	46.000	43.000
BERYLLIUM (UG/L)				DET'N LIMIT = 0.010 GUIDELINE = N/A		
APR	.060 <T	.200 <T	.070 <T	BDL	BDL	BDL
MAY	BDL	.050 <T	BDL	.250 <T	.280 <T	.150 <T
JUN	.090 <T	.140 <T	.120 <T	.030 <T	BDL	.100 <T
JUL	.120 <T	.150 <T	.150 <T	.090 <T	.210 <T	.180 <T
AUG	.280 <T	.110 <T	.040 <T	.160 <T	BDL	.160 <T
SEP	.150 <T	.110 <T	.180 <T	.130 <T	.120 <T	.090 <T
OCT	.060 <T	.030 <T	.030 <T	.040 <T	.060 <T	.090 <T
NOV	.040 <T	.050 <T	.020 <T	.020 <T	BDL	.020 <T
DEC	BDL	BDL	BDL	BDL	BDL	BDL
CADMIUM (UG/L)				DET'N LIMIT = 0.050 GUIDELINE = 5.000 (A1)		
APR	.070 <T	.180 <T	.460 <T	BDL	BDL	.080 <T
MAY	BDL	BDL	BDL	BDL	BDL	BDL
JUN	BDL	BDL	.070 <T	BDL	.110 <T	.090 <T
JUL	BDL	BDL	.140 <T	BDL	BDL	BDL
AUG	BDL	BDL	.460 <T	.090 <T	BDL	BDL
SEP	BDL	BDL	BDL	BDL	BDL	BDL
OCT	BDL	BDL	1.000	BDL	.130 <T	BDL
NOV	BDL	BDL	BDL	BDL	BDL	BDL
DEC	.060 <T	BDL	.090 <T	.070 <T	BDL	BDL
COBALT (UG/L)				DET'N LIMIT = 0.020 GUIDELINE = N/A		
APR	.840 <T	.350 <T	.380 <T	.430 <T	.410 <T	.300 <T
MAY	.340 <T	.150 <T	.060 <T	BDL	.050 <T	.040 <T
JUN	BDL	BDL	.090 <T	.120 <T	BDL	BDL
JUL	BDL	BDL	BDL	BDL	BDL	BDL
AUG	.330 <T	.230 <T	.260 <T	.200 <T	.250 <T	.230 <T
SEP	.060 <T	BDL	BDL	BDL	.250 <T	.230 <T
OCT	.410 <T	.240 <T	.230 <T	.250 <T	.250 <T	.170 <T
NOV	.270 <T	.240 <T	.200 <T	.200 <T	.250 <T	.210 <T
DEC	.090 <T	.100 <T	.040 <T	BDL	.080 <T	.040 <T
CHROMIUM (UG/L)				DET'N LIMIT = 0.100 GUIDELINE = 50. (A1)		
APR	1.100	5.500	2.400	.160 <T	1.900	3.100
MAY	3.300	7.500	.170 <T	14.000	15.000	8.800
JUN	6.200	8.200	3.700	2.500	.910 <T	7.300

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DRINKING WATER SURVEILLANCE PROGRAM CASSELMAN WTP 1989

	WATER TREATMENT PLANT		DISTRIBUTION SYSTEM			
	RAW	TREATED	SITE 1		SITE 2	
			STANDING	FREE FLOW	STANDING	FREE FLOW
JUL	5.000	9.600	4.000	8.300	8.500	8.900
AUG	9.500	8.400	1.800	6.900	.620 <T	7.300
SEP	5.300	6.800	6.500	6.100	7.200	6.400
OCT	1.900	6.900	1.000 <T	1.400	6.700	7.300
NOV	4.200	5.000	.650 <T	.550 <T	1.500	1.300
DEC	BDL	BDL	BDL	BDL	BDL	BDL
COPPER (UG/L)			DET'N LIMIT = .100		GUIDELINE = 1000 (A3)	
APR	3.300	3.500	38.000	9.100	120.000	29.000
MAY	3.000	2.200	15.000	5.800	110.000	16.000
JUN	3.000	2.200	5.000	4.900	88.000	10.000
JUL	2.400	1.800	45.000	8.600	49.000	13.000
AUG	2.000	3.000	55.000	8.800	81.000	16.000
SEP	1.600	2.000	7.000	6.100	120.000	15.000
OCT	1.600	2.400	200.000	5.400	170.000	12.000
NOV	2.200	1.800	160.000	9.200	150.000	10.000
DEC	2.200 <T	2.000 <T	200.000	5.700	130.000	14.000
IRON (UG/L)			DET'N LIMIT = 4.000		GUIDELINE = 300. (A3)	
APR	820.000	51.000	57.000	58.000	69.000	68.000
MAY	590.000	22.000 <T	23.000 <T	25.000 <T	28.000 <T	34.000 <T
JUN	390.000	BDL	19.000 <T	19.000 <T	18.000 <T	16.000 <T
JUL	180.000	7.100 <T	24.000 <T	9.300 <T	23.000 <T	23.000 <T
AUG	200.000	BDL	7.400 <T	BDL	27.000 <T	24.000 <T
SEP	190.000	9.800 <T	12.000 <T	9.300 <T	26.000 <T	17.000 <T
OCT	310.000	17.000 <T	12.000 <T	15.000 <T	20.000 <T	22.000 <T
NOV	250.000	6.400 <T	6.600 <T	6.600 <T	11.000 <T	16.000 <T
DEC	220.000	6.900 <T	BDL	BDL	10.000 <T	12.000 <T
MERCURY (UG/L)			DET'N LIMIT = 0.010		GUIDELINE = 1.000 (A1)	
APR	BDL	BDL	.	BDL	.	.020 <T
MAY	BDL	BDL	.	BDL	.	BDL
JUN	BDL	BDL	.	BDL	.	BDL
JUL	BDL	BDL	.	.020 <T	.	BDL
AUG	.040 <T	BDL	.	.030 <T	.	.040 <T
SEP	.020 <T	.020 <T	.	BDL	.	.020 <T
OCT	.020 <T	.020 <T	.	BDL	.	.020 <T
NOV	.020 <T	.020 <T	.	BDL	.	.020 <T
DEC	.030 <T	.030 <T	.	BDL	.	.030 <T
MANGANESE (UG/L)			DET'N LIMIT = .050		GUIDELINE = 50.0 (A3)	
APR	99.000	88.000	91.000	89.000	88.000	87.000
MAY	34.000	3.700	5.800	4.400	5.700	5.700
JUN	57.000	11.000	12.000	12.000	12.000	12.000
JUL	30.000	6.100	6.000	5.600	7.700	6.200
AUG	65.000	15.000	10.000	12.000	11.000	12.000

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DRINKING WATER SURVEILLANCE PROGRAM CASSELMAN WTP 1989

	WATER TREATMENT PLANT		DISTRIBUTION SYSTEM			
	RAW	TREATED	SITE 1		SITE 2	
			STANDING	FREE FLOW	STANDING	FREE FLOW
SEP	81.000	10.000	7.600	7.300	6.000	5.400
OCT	70.000	33.000	17.000	29.000	21.000	19.000
NOV	32.000	9.900	10.000	8.400	8.900	8.600
DEC	25.000	16.000	12.000	14.000	10.000	10.000
MOLYBDENUM (UG/L)				DET'N LIMIT = 0.020 GUIDELINE = N/A		
APR	.750	1.600	1.700	1.600	1.500	1.500
MAY	1.400	1.700	1.600	1.800	1.800	1.800
JUN	3.300	3.200	3.200	3.600	3.600	3.600
JUL	2.300	2.400	2.400	2.500	2.400	2.300
AUG	2.100	2.600	2.500	2.300	2.400	2.500
SEP	2.200	2.400	2.200	2.300	2.200	2.300
OCT	2.400	2.600	2.400	2.400	2.500	2.500
NOV	2.000	2.500	2.600	2.600	2.400	2.600
DEC	3.900	4.300	4.300	4.300	3.900	4.200
NICKEL (UG/L)				DET'N LIMIT = 0.100 GUIDELINE = 50. (F3)		
APR	1.400 <T	.470 <T	12.000	23.000	30.000	.670 <T
MAY	.630 <T	.550 <T	.190 <T	.280 <T	2.000 <T	.460 <T
JUN	BDL	BDL	.640 <T	1.300 <T	.530 <T	BDL
JUL	BDL	BDL	2.400	BDL	BDL	BDL
AUG	.550 <T	.900 <T	5.100	.450 <T	4.200	.660 <T
SEP	.240 <T	.840 <T	BDL	BDL	3.400	1.000 <T
OCT	.600 <T	.990 <T	24.000	.910 <T	5.500	.450 <T
NOV	1.700 <T	2.000 <T	3.600	1.800 <T	5.900	1.900 <T
DEC	BDL	BDL	7.000	BDL	2.600	BDL
LEAD (UG/L)				DET'N LIMIT = 0.050 GUIDELINE = 50. (A1)		
APR	.830	.640	4.900	1.100	4.200	1.200
MAY	.600	.850	1.300	.590	3.000	.960
JUN	.800	.780	.600	.480	3.400	.830
JUL	.300	.810	2.200	.850	2.300	1.000
AUG	.290	.880	2.700	.800	3.500	1.000
SEP	.450	.860	.730	.710	4.700	1.100
OCT	.600	.780	71.000 RRV	2.600	5.100	.660
NOV	.200 <T	.180 <T	7.900	.950	3.300	.300
DEC	.180 <T	.270 <T	6.700	.480 <T	3.300	.470 <T
ANTIMONY (UG/L)				DET'N LIMIT = .050 GUIDELINE = 146. (D4)		
APR	.440	.500	.530	.730	.510	.470
MAY	.500	.780	.540	.590	.700	.530
JUN	.790	.860	.920	.850	.900	.790
JUL	.560	.580	.750	.690	.720	.550
AUG	.600	.580	.620	.600	.760	.640
SEP	.560	.650	.660	.630	.580	.650
OCT	.470	.610	.560	.610	.600	.580

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DRINKING WATER SURVEILLANCE PROGRAM CASSELMAN WTP 1989

	WATER TREATMENT PLANT		DISTRIBUTION SYSTEM			
	RAW	TREATED	SITE 1		SITE 2	
			STANDING	FREE FLOW	STANDING	FREE FLOW
NOV	.350	.260	.430	.390	.370	.400
DEC	.380 <T	.550	.520	.510	.630	.540
SELENIUM (UG/L)			DET'N LIMIT = 0.200 GUIDELINE = 10. (A1)			
APR	.350 <T	1.000 <T	BDL	BDL	1.600 <T	1.100 <T
MAY	.910 <T	1.700 <T	2.500 <T	4.700 <T	2.100 <T	2.900 <T
JUN	1.800 <T	2.100 <T	1.600 <T	1.400 <T	3.900 <T	1.300 <T
JUL	BDL	6.400	4.700 <T	4.100 <T	3.800 <T	2.900 <T
AUG	3.800 <T	5.300	6.800	7.500	6.400	7.000
SEP	BDL	5.800	7.700	6.700	4.900 <T	4.100 <T
OCT	BDL	1.400 <T	2.000 <T	1.700 <T	1.900 <T	2.200 <T
NOV	1.300 <T	1.700 <T	1.300 <T	1.600 <T	1.700 <T	BDL
DEC	1.700 <T	BDL	1.300 <T	1.500 <T	1.100 <T	1.500 <T
STRONTIUM (UG/L)			DET'N LIMIT = .050 GUIDELINE = N/A			
APR	240.000	230.000	230.000	230.000	210.000	210.000
MAY	340.000	410.000	410.000	430.000	440.000	440.000
JUN	650.000	590.000	670.000	680.000	590.000	590.000
JUL	580.000	550.000	560.000	540.000	520.000	550.000
AUG	620.000	620.000	590.000	630.000	570.000	590.000
SEP	610.000	590.000	590.000	590.000	600.000	580.000
OCT	660.000	660.000	630.000	640.000	660.000	680.000
NOV	630.000	630.000	590.000	580.000	610.000	600.000
DEC	770.000	710.000	700.000	690.000	660.000	680.000
TITANIUM (UG/L)			DET'N LIMIT = .050 GUIDELINE = N/A			
APR	41.000	12.000	12.000	14.000	12.000	12.000
MAY	33.000	12.000	11.000	13.000	12.000	12.000
JUN	26.000	12.000	11.000	12.000	12.000	13.000
JUL	22.000	14.000	14.000	14.000	14.000	14.000
AUG	19.000	7.400	7.400	8.300	7.900	8.200
SEP	23.000	12.000	12.000	12.000	9.500	9.100
OCT	18.000	4.900	4.200	4.400	5.200	5.300
NOV	21.000	9.000	8.400	9.100	8.700	8.900
DEC	22.000	9.700	9.500	9.400	9.900	9.300
THALLIUM (UG/L)			DET'N LIMIT = .010 GUIDELINE = 13. (D4)			
APR	.240	BDL	BDL	BDL	.040 <T	BDL
MAY	.070 <T	.080 <T	.030 <T	.080 <T	.030 <T	.070 <T
JUN	.020 <T	.020 <T	BDL	.020 <T	BDL	BDL
JUL	BDL	BDL	BDL	.030 <T	BDL	BDL
AUG	BDL	BDL	BDL	BDL	BDL	BDL
SEP	.030 <T	.020 <T	.040 <T	BDL	BDL	BDL
OCT	BDL	BDL	.020 <T	.030 <T	BDL	BDL
NOV	.040 <T	BDL	BDL	BDL	BDL	BDL
DEC	BDL	BDL	BDL	BDL	BDL	BDL

TABLE 5

DRINKING WATER SURVEILLANCE PROGRAM CASSELMAN WTP 1989

	WATER TREATMENT PLANT		DISTRIBUTION SYSTEM			
	RAW	TREATED	SITE 1		SITE 2	
			STANDING	FREE FLOW	STANDING	FREE FLOW
URANIUM (UG/L)				DET'N LIMIT = .020	GUIDELINE = 100.(B1)	
APR	1.200	.310	.310	.310	.310	.300
MAY	1.800	1.200	1.100	1.200	1.400	1.400
JUN	1.900	1.400	1.200	1.300	1.300	1.400
JUL	1.800	1.300	1.300	1.200	1.200	1.100
AUG	1.700	.930	.850	1.000	.930	.890
SEP	1.200	.720	.740	.810	.880	.790
OCT	1.100	.630	.580	.570	.540	.590
NOV	1.600	.750	.750	.710	.710	.720
DEC	2.700	2.000	2.200	2.200	1.900	2.200
VANADIUM (UG/L)				DET'N LIMIT = .050	GUIDELINE = N/A	
APR	2.400	.740	.720	.730	.770	.700
MAY	2.000	.720	.680	.840	.840	.810
JUN	3.000	1.700	1.700	1.800	1.600	1.700
JUL	2.900	1.900	2.100	1.900	1.700	1.800
AUG	3.100	2.300	2.100	2.300	2.200	2.200
SEP	3.400	2.400	2.400	2.400	2.200	2.300
OCT	3.500	4.000	3.700	3.900	3.700	3.900
NOV	2.000	2.800	2.800	2.600	2.700	2.600
DEC	1.400	2.800	2.700	2.800	2.600	2.800
ZINC (UG/L)				DET'N LIMIT = .001	GUIDELINE = 5000. (A3)	
APR	9.000	4.300	14.000	5.100	27.000	9.100
MAY	7.100	4.200	9.000	4.600	36.000	9.000
JUN	5.900	3.300	4.400	3.600	54.000	5.000
JUL	4.100	4.000	22.000	6.300	13.000	4.900
AUG	2.800	2.800	30.000	4.100	57.000	4.800
SEP	3.100	3.200	3.600	3.500	53.000	3.900
OCT	3.200	3.000	68.000	2.300	160.000	3.700
NOV	5.100	4.600	55.000	5.800	110.000	5.200
DEC	5.900	4.400	100.000	4.400	110.000	6.300

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DRINKING WATER SURVEILLANCE PROGRAM CASSELMAN WTP 1989

	WATER TREATMENT PLANT		DISTRIBUTION SYSTEM			
	RAW	TREATED	SITE 1		SITE 2	
			STANDING	FREE FLOW	STANDING	FREE FLOW
PESTICIDES & PCB						
ALPHA BHC (NG/L)			DET'N LIMIT = 1.000		GUIDELINE = 700 (G)	
APR	BDL	BDL	.	BDL	.	BDL
MAY	BDL	BDL	.	BDL	.	BDL
JUN	BDL	BDL	.	BDL	.	3.000 <T
JUL	BDL	BDL	.	BDL	.	BDL
AUG	BDL	ILA	.	BDL	.	BDL
SEP	BDL	BDL	.	BDL	.	BDL
OCT	IQU	IQU	.	IQU	.	IQU
NOV	BDL	BDL	.	BDL	.	BDL
DEC	BDL	BDL	.	BDL	.	BDL
LINDANE (NG/L)			DET'N LIMIT = 1.000		GUIDELINE = 4000 (A1)	
APR	BDL	BDL	.	BDL	.	BDL
MAY	BDL	BDL	.	BDL	.	BDL
JUN	1.000 <T	3.000 <T	.	BDL	.	3.000 <T
JUL	BDL	BDL	.	BDL	.	BDL
AUG	BDL	ILA	.	BDL	.	BDL
SEP	BDL	BDL	.	BDL	.	BDL
OCT	IQU	IQU	.	IQU	.	IQU
NOV	BDL	BDL	.	BDL	.	BDL
DEC	BDL	BDL	.	BDL	.	BDL
ATRAZINE (NG/L)			DET'N LIMIT = 50.00		GUIDELINE = 60000 (B3)	
APR	BDL	BDL	.	BDL	.	BDL
MAY	420.000 <T	380.000 <T	.	360.000 <T	.	300.000 <T
JUN	BDL	BDL	.	BDL	.	BDL
JUL	BDL	2670.000	.	2470.000	.	1920.000
AUG	5520.000	3310.000	.	.	.	IIS
SEP	2060.000	1850.000	.	.	.	.
OCT	2060.000	2070.000	.	IAW	.	IAW
NOV	640.000	850.000	.	.	.	.
DEC	BDL	BDL	.	.	.	.
CYANAZINE (NG/L)			DET'N LIMIT = 100.00		GUIDELINE = 10000 (B3)	
APR	BDL	BDL	.	BDL	.	BDL
MAY	BDL	BDL	.	BDL	.	BDL
JUN	BDL	BDL	.	BDL	.	BDL
JUL	IRO	220.000 <T	.	190.000 <T	.	190.000 <T
AUG	250.000 <T	170.000 <T	.	.	.	IIS
SEP	160.000 <T	130.000 <T	.	.	.	.
OCT	BDL	BDL	.	IAW	.	IAW
NOV	BDL	BDL	.	.	.	.
DEC	BDL	BDL	.	.	.	.
D-ETHYL ATRAZINE (NG/L)			DET'N LIMIT = N/A		GUIDELINE = N/A	
APR	BDL	BDL	.	BDL	.	BDL

TABLE 5

DRINKING WATER SURVEILLANCE PROGRAM CASSELMAN WTP 1989

	WATER TREATMENT PLANT		DISTRIBUTION SYSTEM			
	RAW	TREATED	SITE 1		SITE 2	
			STANDING	FREE FLOW	STANDING	FREE FLOW
MAY	280.000 <T	290.000 <T	.	330.000 <T	.	223.000 <T
JUN	BDL	BDL	.	BDL	.	BDL
JUL	BDL	570.000 <T	.	560.000 <T	.	530.000 <T
AUG	1200.000 <T	850.000 <T	.	.	.	IIS
SEP	390.000 <T	620.000 <T	.	.	.	.
OCT	1580.000 <T	930.000 <T	.	IAW	.	IAW
NOV	240.000 <T	260.000 <T	.	.	.	.
DEC	BDL	BDL	.	.	.	.
METOLACHLOR (NG/L)			DET'N LIMIT = 500.		GUIDELINE = 50000 (B3)	
APR	BDL	BDL	.	BDL	.	BDL
MAY	BDL	BDL	.	BDL	.	BDL
JUN	BDL	BDL	.	BDL	.	BDL
JUL	BDL	750.000 <T	.	690.000 <T	.	670.000 <T
AUG	840.000 <T	BDL	.	.	.	IIS
SEP	BDL	BDL	.	.	.	.
OCT	BDL	BDL	.	IAW	.	IAW
NOV	BDL	BDL	.	.	.	.
DEC	BDL	BDL	.	.	.	.

TABLE 5

DRINKING WATER SURVEILLANCE PROGRAM CASSELMAN WTP 1989

	WATER TREATMENT PLANT		DISTRIBUTION SYSTEM			
	RAW	TREATED	SITE 1		SITE 2	
			STANDING	FREE FLOW	STANDING	FREE FLOW
PHENOLICS (UG/L PHENOLICS)			DET'N LIMIT = 0.2		GUIDELINE = 2.00 (A3)	
APR	13.000	5.000	.	.	.	.
MAY	3.600	3.800	.	.	.	.
JUN	2.000	2.200	.	.	.	.
JUL	2.600	3.200	.	.	.	.
AUG	1.200	1.200	.	.	.	.
SEP	2.400	2.800	.	.	.	.
OCT	3.200	2.600	.	.	.	.
NOV	1.400	1.800	.	.	.	.
DEC	1.400	1.000	.	.	.	.

TABLE 5

DRINKING WATER SURVEILLANCE PROGRAM CASSELMAN WTP 1989

	WATER TREATMENT PLANT		DISTRIBUTION SYSTEM			
	RAW	TREATED	SITE 1		SITE 2	
			STANDING	FREE FLOW	STANDING	FREE FLOW
VOLATILES						
BENZENE (UG/L)				DET'N LIMIT = .050 GUIDELINE = 5.0 (81)		
APR	BDL	BDL	.	BDL	.	BDL
MAY	.100 <T	.050 <T	.	.050 <T	.	.050 <T
JUN	BDL	.050 <T	.	BDL	.	.050 <T
JUL	BDL	BDL	.	.050 <T	.	BDL
AUG	BDL	BDL	.	BDL	.	BDL
SEP	BDL	.100 <T	.	.050 <T	.	.050 <T
OCT	BDL	BDL	.	.100 <T	.	.050 <T
NOV	BDL	BDL	.	BDL	.	BDL
DEC	BDL	BDL	.	.050 <T	.	BDL
TOLUENE (UG/L)				DET'N LIMIT = .050 GUIDELINE = 24.0 (84)		
APR	BDL	.200 <T	.	.200 <T	.	.250 <T
MAY	.500	.400 <T	.	.350 <T	.	.350 <T
JUN	BDL	.150 <T	.	.100 <T	.	.250 <T
JUL	BDL	.250 <T	.	.400 <T	.	.050 <T
AUG	BDL	.100 <T	.	.050 <T	.	.100 <T
SEP	BDL	.100 <T	.	.150 <T	.	.050 <T
OCT	BDL	.300 <T	.	.300 <T	.	.200 <T
NOV	BDL	BDL	.	.050 <T	.	.050 <T
DEC	BDL	.350 <T	.	.300 <T	.	.150 <T
ETHYLBENZENE (UG/L)				DET'N LIMIT = .050 GUIDELINE = 2.4 (84)		
APR	.100 <T	.050 <T	.	.100 <T	.	.050 <T
MAY	.050 <T	.050 <T	.	.050 <T	.	.050 <T
JUN	BDL	.050 <T	.	.050 <T	.	.100 <T
JUL	BDL	.050 <T	.	.100 <T	.	BDL
AUG	BDL	BDL	.	BDL	.	.050 <T
SEP	BDL	BDL	.	BDL	.	BDL
OCT	BDL	.050 <T	.	BDL	.	.050 <T
NOV	BDL	BDL	.	BDL	.	BDL
DEC	BDL	BDL	.	BDL	.	BDL
M-XYLENE (UG/L)				DET'N LIMIT = .100 GUIDELINE = 300 (84)		
APR	.300 <T	.100 <T	.	.100 <T	.	.100 <T
MAY	.300 <T	.100 <T	.	.100 <T	.	.100 <T
JUN	BDL	BDL	.	BDL	.	BDL
JUL	BDL	.100 <T	.	.200 <T	.	BDL
AUG	BDL	BDL	.	BDL	.	BDL
SEP	BDL	BDL	.	BDL	.	BDL
OCT	BDL	.100 <T	.	.100 <T	.	.100 <T
NOV	BDL	BDL	.	BDL	.	BDL
DEC	BDL	BDL	.	BDL	.	BDL
O-XYLENE (UG/L)				DET'N LIMIT = .050 GUIDELINE = 300 (84)		
APR	.150 <T	.100 <T	.	.100 <T	.	.100 <T

TABLE 5

DRINKING WATER SURVEILLANCE PROGRAM CASSELMAN WTP 1989

	WATER TREATMENT PLANT		DISTRIBUTION SYSTEM			
	RAW	TREATED	SITE 1		SITE 2	
			STANDING	FREE FLOW	STANDING	FREE FLOW
MAY	.150 <T	.100 <T	.	.100 <T	.	.100 <T
JUN	BDL	.050 <T	.	BDL	.	.050 <T
JUL	BDL	.100 <T	.	.100 <T	.	BDL
AUG	BDL	.050 <T	.	.050 <T	.	.050 <T
SEP	BDL	.050 <T	.	.050 <T	.	BDL
OCT	BDL	.100 <T	.	.100 <T	.	.050 <T
NOV	BDL	BDL	.	BDL	.	BDL
DEC	BDL	.050 <T	.	BDL	.	BDL
STYRENE (UG/L)				DET'N LIMIT = .050	GUIDELINE = 46.5 (D2)	
APR	.050 <T	.250 <T	.	.300 <T	.	.200 <T
MAY	BDL	.100 <T	.	.100 <T	.	.100 <T
JUN	BDL	.250 <T	.	.200 <T	.	.350 <T
JUL	BDL	.300 <T	.	.300 <T	.	.100 <T
AUG	BDL	.100 <T	.	.050 <T	.	.200 <T
SEP	BDL	BDL	.	BDL	.	BDL
OCT	BDL	.100 <T	.	BDL	.	BDL
NOV	BDL	BDL	.	BDL	.	BDL
DEC	BDL	.100 <T	.	.100 <T	.	BDL
CHLOROFORM (UG/L)				DET'N LIMIT = .100	GUIDELINE = 350 (A1+)	
APR	.200 <T	11.700	.	10.800	.	11.000
MAY	1.200	130.000	.	140.000	.	140.000
JUN	.700 <T	85.000	.	80.000	.	80.000
JUL	7.200	360.000	.	399.000	.	340.000
AUG	1.500	240.000	.	210.000	.	243.000
SEP	3.800	302.000	.	262.000	.	249.000
OCT	1.900	142.600	.	145.000	.	143.300
NOV	.300 <T	61.700	.	57.100	.	52.400
DEC	.300 <T	62.200	.	66.800	.	73.600
111, TRICHLOROETHANE (UG/L)				DET'N LIMIT = .020	GUIDELINE = 200 (D1)	
APR	BDL	BDL	.	.060 <T	.	.040 <T
MAY	BDL	BDL	.	BDL	.	BDL
JUN	.020 <T	BDL	.	BDL	.	BDL
JUL	BDL	BDL	.	BDL	.	BDL
AUG	.020 <T	BDL	.	BDL	.	BDL
SEP	BDL	BDL	.	BDL	.	BDL
OCT	BDL	BDL	.	BDL	.	BDL
NOV	BDL	BDL	.	BDL	.	BDL
DEC	BDL	BDL	.	BDL	.	BDL
DICHLOROBROMOMETHANE (UG/L)				DET'N LIMIT = .050	GUIDELINE = 350 (A1+)	
APR	BDL	.500 <T	.	.500	.	.500
MAY	BDL	6.000	.	6.100	.	6.050
JUN	BDL	8.100	.	7.500	.	8.500

TABLE 5

DRINKING WATER SURVEILLANCE PROGRAM CASSELMAN WTP 1989

	WATER TREATMENT PLANT		DISTRIBUTION SYSTEM			
	RAW	TREATED	SITE 1		SITE 2	
			STANDING	FREE FLOW	STANDING	FREE FLOW
JUL	.400 <T	21.400	.	20.400	.	17.800
AUG	.200 <T	25.600	.	24.700	.	25.600
SEP	.350 <T	36.450	.	33.950	.	32.500
OCT	.450 <T	27.950	.	30.400	.	29.400
NOV	BDL	11.450	.	10.650	.	10.150
DEC	BDL	13.000	.	14.400	.	12.700
CHLORODIBROMOMETHANE (UG/L)				DET'N LIMIT = .100 GUIDELINE = 350 (A1+)		
APR	BDL	BDL	.	BDL	.	BDL
MAY	BDL	.300 <T	.	BDL	.	BDL
JUN	BDL	.500 <T	.	.500 <T	.	.600 <T
JUL	BDL	.700 <T	.	.600 <T	.	.600 <T
AUG	BDL	1.500	.	1.600	.	1.700
SEP	BDL	2.400	.	2.400	.	2.200
OCT	BDL	2.800	.	2.700	.	3.100
NOV	BDL	1.500	.	1.100	.	1.000 <T
DEC	BDL	1.600	.	1.200	.	1.300
T-CHLOROETHYLENE (UG/L)				DET'N LIMIT = .050 GUIDELINE = 10.0 (C2)		
APR	BDL	BDL	.	BDL	.	BDL
MAY	BDL	BDL	.	BDL	.	BDL
JUN	BDL	BDL	.	BDL	.	BDL
JUL	BDL	BDL	.	BDL	.	BDL
AUG	BDL	BDL	.	BDL	.	BDL
SEP	BDL	BDL	.	BDL	.	BDL
OCT	BDL	BDL	.	BDL	.	BDL
NOV	BDL	BDL	.	BDL	.	BDL
DEC	BDL	BDL	.	BDL	.	.100 <T
BROMOFORM (UG/L)				DET'N LIMIT = .200 GUIDELINE = 350 (A1+)		
APR	BDL	BDL	.	BDL	.	BDL
MAY	BDL	BDL	.	BDL	.	BDL
JUN	BDL	BDL	.	BDL	.	BDL
JUL	BDL	BDL	.	BDL	.	BDL
AUG	BDL	BDL	.	BDL	.	BDL
SEP	BDL	BDL	.	BDL	.	BDL
OCT	BDL	BDL	.	.600 <T	.	.800 <T
NOV	BDL	BDL	.	.800 <T	.	BDL
DEC	BDL	BDL	.	BDL	.	BDL
TOTL TRIHALOMETHANES (UG/L)				DET'N LIMIT = .500 GUIDELINE = 350 (A1)		
APR	BDL	12.200	.	11.300	.	11.500
MAY	1.200 <T	136.300	.	146.100	.	146.050
JUN	.700 <T	93.600	.	88.000	.	89.100
JUL	7.600	382.100	.	420.000	.	358.600
AUG	1.700 <T	267.100	.	236.300	.	270.300

TABLE 5

DRINKING WATER SURVEILLANCE PROGRAM CASSELMAN WTP 1989

	WATER TREATMENT PLANT		DISTRIBUTION SYSTEM			
	RAW	TREATED	SITE 1		SITE 2	
			STANDING	FREE FLOW	STANDING	FREE FLOW
SEP	4.150 <T	340.850	.	298.350	.	283.700
OCT	2.350 <T	173.350	.	178.700	.	176.600
NOV	BDL	74.650	.	69.650	.	63.550
DEC	BDL	76.800	.	82.400	.	87.600

TRACE LEVELS OF TOLUENE ARE LABORATORY ARTIFACTS DERIVED FROM THE ANALYTICAL METHODOLOGY.

TRACE LEVELS OF STYRENE ARE CONSIDERED TO BE LABORATORY ARTIFACTS RESULTING FROM THE LABORATORY SHIPPING CONTAINERS.

Table 6

SCAN/PARAMETER	UNIT	DETECTION LIMIT	GUIDELINE
BACTERIOLOGICAL			
STANDARD PLATE COUNT MEMBRANE FILTRATION	CT/ML	0	500/ML(A1)
P/A BOTTLE		0	0 (A1*)
TOTAL COLIFORM MEMBRANE FILTRATION	CT/100ML	0	5/100mL(A1)
TOTAL COLIFORM BACKGROUND MF	CT/100ML	0	N/A
CHLOROAROMATICS			
HEXACHLOROBUTADIENE	NG/L	1.000	450. (D4)
1,2,3-TRICHLOROBENZENE	NG/L	5.000	10000 (I)
1,2,3,4-TETRACHLOROBENZENE	NG/L	1.000	10000 (I)
1,2,3,5-TETRACHLOROBENZENE	NG/L	1.000	10000 (I)
1,2,4-TRICHLOROBENZENE	NG/L	5.000	10000 (I)
1,2,4,5-TETRACHLOROBENZENE	NG/L	1.000	38000 (D4)
1,3,5-TRICHLOROBENZENE	NG/L	5.000	10000 (D4)
HEXACHLOROBENZENE	NG/L	1.0	10. (C1)
HEXACHLOROETHANE	NG/L	1.000	1900. (D4)
OCTACHLOROSTYRENE	NG/L	1.000	N/A
PENTACHLOROBENZENE	NG/L	1.000	74000 (D4)
2,3,6-TRICHLOROTOLUENE	NG/L	5.000	N/A
2,4,5-TRICHLOROTOLUENE	NG/L	5.000	N/A
2,6,A-TRICHLOROTOLUENE	NG/L	5.000	N/A
CHLOROPHENOLS			
2,3,4-TRICHLOROPHENOL	NG/L	50.	N/A
2,3,4,5-TETRACHLOROPHENOL	NG/L	50.	N/A
2,3,5,6-TETRACHLOROPHENOL	NG/L	50.	N/A
2,4,5-TRICHLOROPHENOL	NG/L	50.	2600000 (D4)
2,4,6-TRICHLOROPHENOL	NG/L	50.	2000. (B4)
PENTACHLOROPHENOL	NG/L	50.	30000. (B4)
CHEMISTRY (FLD)			
FIELD COMBINED CHLORINE RESIDUAL	MG/L	N/A	N/A
FIELD FREE CHLORINE RESIDUAL	MG/L	N/A	N/A
FIELD TOTAL CHLORINE RESIDUAL	MG/L	N/A	N/A
FIELD PH	DMSNLESS	N/A	6.5-8.5(A4)
FIELD TEMPERATURE	^{o}C	N/A	<15 ^{o}C(A1)
FIELD TURBIDITY	FTU	N/A	1.0 (A1)
CHEMISTRY (LAB)			
ALKALINITY	MG/L	.200	30-500(A4)
CALCIUM	MG/L	.100	100. (F2)
CYANIDE	MG/L	.001	.20(A1)
CHLORIDE	MG/L	.200	250. (A3)
COLOUR	TCU	.5	5.0 (A3)
CONDUCTIVITY	UMHO/CM	1.	400. (F2)
FLUORIDE	MG/L	.01	2.4 (A1)
HARDNESS	MG/L	.50	80-100(A4)
MAGNESIUM	MG/L	.05	30. (F2)

SCAN/PARAMETER	UNIT	DETECTION LIMIT	GUIDELINE
NITRITE	MG/L	.001	1.0 (A1)
TOTAL NITRATES	MG/L	.02	10. (A1)
NITROGEN TOTAL KJELDAHL	MG/L	.02	N/A
PH	DMSNLESS	N/A	6.5-8.5(A4)
PHOSPHORUS FIL REACT	MG/L	.0005	N/A
PHOSPHORUS TOTAL	MG/L	.002	.40(F2)
TOTAL SOLIDS	MG/L	1.	500. (A3)
TURBIDITY	FTU	.02	1.0 (A1)
METALS			
ALUMINUM	UG/L	.050	100. (A4)
ANTIMONY	UG/L	.050	10. (F3)
ARSENIC	UG/L	.050	50. (A1)
BARIUM	UG/L	.020	1000. (A1)
BORON	UG/L	.200	5000. (A1)
BERYLLIUM	UG/L	.010	0.20 (H)
CADMIUM	UG/L	.050	5.0 (A1)
COBALT	UG/L	.020	1000. (H)
CHROMIUM	UG/L	.100	50. (A1)
COPPER	UG/L	.100	1000. (A3)
IRON	UG/L	5.0	300. (A3)
MERCURY	UG/L	.01	1.0 (A1)
MANGANESE	UG/L	.050	50. (A3)
MOLYBDENUM	UG/L	.020	500. (H)
NICKEL	UG/L	.100	50. (F3)
LEAD	UG/L	.020	50. (A1)
SELENIUM	UG/L	.200	10. (A1)
SILVER	UG/L	.020	50. (A1)
STRONTIUM	UG/L	.100	2000. (H)
THALLIUM	UG/L	.010	13. (D4)
TITANIUM	UG/L	.100	N/A
URANIUM	UG/L	.020	20. (A2)
VANADIUM	UG/L	.020	100. (H)
ZINC	UG/L	.020	5000. (A3)
PHENOLICS			
PHENOLICS (UNFILTERED REACTIVE)	UG/L	.2	2.0 (A3)
PESTICIDES & PCB			
ALDRIN	NG/L	1.0	700. (A1)
AMETRINE	NG/L	50.	300000. (D3)
ATRAZINE	NG/L	50.	60000. (B3)
ALPHA HEXACHLOROCYCLOHEXANE (BHC)	NG/L	1.0	700. (G)
BETA HEXACHLOROCYCLOHEXANE (BHC)	NG/L	1.0	300. (G)
GAMMA HEXACHLOROCYCLOHEXANE(LINDANE)	NG/L	1.0	4000. (A1)
ALPHA CHLORDANE	NG/L	2.0	7000. (A1)
GAMMA CHLORDANE	NG/L	2.0	7000. (A1)
BLADEX	NG/L	100.	10000. (B3)
DIELDRIN	NG/L	2.0	700. (A1)
METHOXYCHLOR	NG/L	5.0	900000. (B1)
ENDOSULFAN 1 (THIODAN I)	NG/L	2.0	74000. (D4)
ENDOSULFAN 2 (THIODAN II)	NG/L	4.0	74000. (D4)
ENDRIN	NG/L	4.0	200. (A1)
ENDOSULFAN SULPHATE(THIODAN SULPHATE)	NG/L	4.0	N/A
HEPTACHLOR EPOXIDE	NG/L	1.0	3000. (A1)

SCAN/PARAMETER	UNIT	DETECTION LIMIT	GUIDELINE	
HEPTACHLOR	NG/L	1.0	3000.	(A1)
METOLACHLOR	NG/L	500.	50000.	(B3)
MIREX	NG/L	5.0	N/A	
OXYCHLORDANE	NG/L	2.0	N/A	
O,P-DDT	NG/L	5.0	30000.	(A1)
PCB	NG/L	20.0	3000.	(A2)
O,P-DDD	NG/L	5.0	N/A	
PPDDE	NG/L	1.0	30000.	(A1)
PPDDT	NG/L	5.0	30000.	(A1)
ATRATONE	NG/L	50.	N/A	
ALACHLOR	NG/L	500.	35000.	(D2)
PROMETONE	NG/L	50.	52500.	(D3)
PROPAZINE	NG/L	50.	16000.	(D2)
PROMETRYNE	NG/L	50.	1000.	(B3)
SENCOR (METRIBUZIN)	NG/L	100.	80000.	(B2)
SIMAZINE	NG/L	50.	10000.	(B3)
POLYAROMATIC HYDROCARBONS				
PHENANTHRENE	NG/L	10.0	N/A	
ANTHRACENE	NG/L	1.0	N/A	
FLUORANTHENE	NG/L	20.0	42000.	(D4)
PYRENE	NG/L	20.0	N/A	
BENZO(A)ANTHRACENE	NG/L	20.0	N/A	
CHRYSENE	NG/L	50.0	N/A	
DIMETHYL BENZO(A)ANTHRACENE	NG/L	5.0	N/A	
BENZO(E)PYRENE	NG/L	50.0	N/A	
BENZO(B)FLUORANTHENE	NG/L	10.0	N/A	
PERYLENE	NG/L	10.0	N/A	
BENZO(K)FLUORANTHENE	NG/L	1.0	N/A	
BENZO(A)PYRENE	NG/L	5.0	10.	(B1)
BENZO(G,H,I)PERYLENE	NG/L	20.0	N/A	
DIBENZO(A,H)ANTHRACENE	NG/L	10.0	N/A	
INDENO(1,2,3-C,D)PYRENE	NG/L	20.0	N/A	
BENZO(B)CHRYSENE	NG/L	2.0	N/A	
CORONENE	NG/L	10.0	N/A	
SPECIFIC PESTICIDES				
TOXAPHENE	NG/L	N/A	5000.	(A1)
2,4,5-TRICHLOROBUTYRIC ACID (2,4,5-T)	NG/L	50.	200000.	(B4)
2,4-DICHLOROBUTYRIC ACID (2,4-D)	NG/L	100.	100000.	(A1)
2,4-DICHLOROPHENOXYBUTYRIC ACID	NG/L	200.	18000.	(B3)
2,4-D PROPIONIC ACID	NG/L	100.	N/A	
DICAMBA	NG/L	100.	120000.	(B1)
PICLORAM	NG/L	100.	190000.	(B3)
SILVEX (2,4,5-TP)	NG/L	50.	10000.	(A1)
DIAZINON	NG/L	20.	20000.	(B1)
DICHLOROVOS	NG/L	20.	N/A	
DURSBAN	NG/L	20.	N/A	
ETHION	NG/L	20.	35000.	(G)
GUTHION(AZINPHOSMETHYL)	NG/L	N/A	20000.	(B1)
MALATHION	NG/L	20.	190000.	(B1)
MEVINPHOS	NG/L	20.	N/A	
METHYL PARATHION	NG/L	50.	7000.	(A1)
METHYLTRITHION	NG/L	20.	N/A	
PARATHION	NG/L	20.	50000.	(B1)

SCAN/PARAMETER	UNIT	DETECTION LIMIT	GUIDELINE	
PHORATE (THIMET)	NG/L	20.	2000.	(B3)
RELDAN	NG/L	20.	N/A	
RONNEL	NG/L	20.	N/A	
AMINOCARB	NG/L	N/A	N/A	
BENONYL	NG/L	N/A	N/A	
BUX (METALKAMATE)	NG/L	2000.	N/A	
CARBOFURAN	NG/L	2000.	90000.	(B1)
CICP (CHLORPROPHAM)	NG/L	2000.	350000.	(G)
DIALLATE	NG/L	2000.	30000.	(H)
EPTAM	NG/L	2000.	N/A	
IPC	NG/L	2000.	N/A	
PROPOXUR (BAYGON)	NG/L	2000.	90000.	(G)
SEVIN (CARBARYL)	NG/L	200.	90000.	(B1)
SUTAN (BUTYLATE)	NG/L	2000.	245000.	(D3)
VOLATILES				
BENZENE	UG/L	.050	5.0	(B1)
TOLUENE	UG/L	.050	24.0	(B4)
ETHYLBENZENE	UG/L	.050	2.4	(B4)
PARA-XYLENE	UG/L	.100	300.	(B4)
META-XYLENE	UG/L	.100	300.	(B4)
ORTHO-XYLENE	UG/L	.050	300.	(B4)
1,1-DICHLOROETHYLENE	UG/L	.100	7.0	(D1)
ETHLYENE DIBROMIDE	UG/L	.05	.05	G)
METHYLENE CHLORIDE	UG/L	.500	50.	(B1)
TRANS-1,2-DICHLOROETHYLENE	UG/L	.100	70.	(D5)
1,1-DICHLOROETHANE	UG/L	.100	N/A	
CHLOROFORM	UG/L	.100	350.	(A1+)
1,1,1-TRICHLOROETHANE	UG/L	.020	200.	(D1)
1,2-DICHLOROETHANE	UG/L	.050	5.0	(D1)
CARBON TETRACHLORIDE	UG/L	.200	5.0	(B1)
1,2-DICHLOROPROPANE	UG/L	.050	6.0	(D5)
TRICHLOROETHYLENE	UG/L	.100	50.	(B1)
DICHLOROBROMOMETHANE	UG/L	.050	350.	(A1+)
1,1,2-TRICHLOROETHANE	UG/L	.050	.60	(D4)
CHLORODIBROMOMETHANE	UG/L	.100	350.	(A1+)
TETRACHLOROETHYLENE	UG/L	.050	10.0	(C2)
BROMOFORM	UG/L	.200	350.	(A1+)
1,1,2,2-TETRACHLOROETHANE	UG/L	.050	0.17	(D4)
CHLOROBENZENE	UG/L	.100	60.	(D5)
1,4-DICHLOROBENZENE	UG/L	.100	1.0	(B4)
1,3-DICHLOROBENZENE	UG/L	.100	130.	(G)
1,2-DICHLOROBENZENE	UG/L	.050	3.0	(B4)
TRIFLUOROCHLOROTOLUENE	UG/L	.100	N/A	
TOTAL TRIHALOMETHANES	UG/L	.500	350.	(A1)
STYRENE	UG/L	.05	140.	(D5)

Appendix A

DRINKING WATER SURVEILLANCE PROGRAM

The Drinking Water Surveillance Program (DWSP) for Ontario monitors drinking water quality at municipal water supply systems. The DWSP Database Management System provides a computerized drinking water quality information system for the supplies monitored. The objectives of the program are to provide:

- immediate, reliable, current information on drinking water quality,
- a flagging mechanism for 'Objective' exceedence,
- a definition of contaminant levels and trends,
- a comprehensive background for remedial action,
- a framework for assessment of new contaminants,
- and an indication of treatment efficiency of plant processes.

Program

The DWSP officially began in April 1986 and is designed to eventually include all municipal water supplies in Ontario; currently 44 plants are being monitored. Water supply locations have been prioritized for surveillance, based primarily on criteria such as population density, probability of contamination and geographical location.

An ongoing assessment of future monitoring requirements at each location will be made. Monitoring will continue at the initial locations at an appropriate level and further locations will be phased into the program as resources permit. It is estimated that after 4 years of operation, the program will be monitoring 90 locations.

A major goal of the program is to collect valid water quality data, in context with plant operational characteristics at the time of sampling. As soon as sufficient data have been accumulated and analysed, both the frequency of sampling and the range of parameters may be adjusted accordingly.

Assessments are carried out at all locations prior to initial sampling in order to acquire complete plant process and distribution system details, and to designate (and retrofit if necessary) all sampling systems and locations. This ensures that the sampled water is a reflection of the water itself.

Samples are taken of the raw (ambient water) and the treated water at the treatment plant, and of consumer's tap water in the distribution system. In order to determine possible effects of distribution on water quality, both standing and free flow water in old and new sections of the distribution system are sampled.

Sampling is carried out by operational personnel who have been trained in the applicable procedures.

Comprehensive standardized procedures and Field Test kits are supplied to sampling personnel. This ensures that samples are taken and handled according to standard protocols and that field testing will supply reliable data. All field and laboratory analyses are carried out using "approved documented procedures". All laboratory analyses are carried out by the MOE Laboratory Services Branch.

Data Reporting Mechanism

When the analytical results are transferred from the MOE laboratory into the DWSP system, printouts of the completed analyses are sent to the MOE District Officer, the appropriate operational staff and are also retained by the DWSP co-ordinator.

DWSP INPUTS AND OUTPUTS

The DWSP INPUTS and OUTPUTS are illustrated in Fig. 1.

PROGRAM INPUTS

PLANT AND DISTRIBUTION SYSTEM DESCRIPTION

The system description includes plant specific non-analytical information acquired through a questionnaire and initial plant

visit. During the initial assessment of the plant and distribution system the questionnaire content is verified and missing information added. It is intended that all data be kept current with scheduled annual updates.

The PLANT and DISTRIBUTION SYSTEM DESCRIPTION consists of the following seven components.

1. Process component inventory

All physical and chemical processes that the water is subjected to, from the intake pipe to the consumers' tap (where possible), are documented. These include: process type, general description of physical structures, material types, sizes, and retention time for each process within the plant. The processes may be as simple as transmission or as complex as carbon adsorption.

2. Treatment chemicals

Chemicals used in the treatment processes, their function, application point, supplier and brand-name are recorded. The chemical dosages applied on the day of sampling are recorded in DWSP.

3. Process control measurements

Documentation of in-plant monitoring of process parameters (turbidity, chlorine residuals, pH, aluminum residuals) including methods used, monitoring locations and frequency is contained in

this section. In-plant monitoring results are generally not retained in DWSP but are retained by the Water Treatment Plant.

4. Design flow and retention time

The hydraulic capacity, designed and actual, is noted here. Retention time (the time that a block of water is retained in the plant) is also noted. The maximum, minimum and average flow as well as a record of the flow rate on the day of sampling are recorded in DWSP.

5. Distribution system description

This area includes the storage and transmission characteristics of the distribution system after the water leaves the plant.

6. Sampling system

Each plant is assessed for its adequacy in terms of sampling of bacteriological, organic and inorganic parameters. The prime considerations in the assessment and design of the sampling system are:

i/ the sample is an accurate representation of the actual water condition, eg. raw water has had no chemical treatment;

ii/ the water being sampled is not being modified by the sampling system;

iii/ the sample tap must be in a clean area of the plant,

preferably a lab area;

iv/ the sample lines must be organically inert (no plastic, ideally stainless steel).

It is imperative that the sampled water be a reflection not of the sampling system but of the water itself.

The sampling system documentation includes: origin of the water; date sampling was initiated; size, length and material type (intake, discharge and tap), pump characteristics (model, type, capacity) and flow rate.

7. People

This section contains the names, addresses and phone numbers of current plant management and operational staff, distribution system management and operational staff, Medical Officer of Health and appropriate Ministry of Environment personnel associated with the plant.

FIELD DATA

The second major input to DWSP is field data.

Field data is collected at the plant and from the distribution system sites on the day of sampling. The field data consists of general operating conditions and the results of testing for field parameters. General operating conditions include chemicals used,

dosages, flow and retention time on the day of sampling as well as monthly maximum, minimum and average flows. Field parameters include turbidity, chlorine residuals (free,combined and total), temperature and pH. These parameters are analysed according to standardized DWSP protocols to allow for interplant comparison.

LABORATORY ANALYTICAL DATA

The third major input to DWSP is Laboratory Analytical Data.

Samples gathered from the raw, treated and distribution sampling sites are analyzed for approximately 180 parameters at a frequency of two to twelve times per year. Sixty-five percent of the parameters are organic. The parameters measured may have health or aesthetic implications when present in drinking water. Many of the parameters may be used in the treatment process or may be treatment by-products. Due to the nature of certain analytical instruments parameters may be measured for in a "scan" producing some results for parameters that are not on the DWSP priority list but which may be of interest. The majority of the parameters are measured on a routine basis however, those that are technically more difficult and/or costly to analyse for are done less frequently. These include Specific Pesticides and Chlorophenols.

Although the parameter list is extensive, additional parameters with the potential to cause health or aesthetic related problems

may be added provided reliable analytical and sampling methods exist.

All laboratory generated data is derived from standardized, documented analytical protocols. The analytical method is an integral part of the data and as methods change notation will e be made and intercomparison data documented.

PARAMETER REFERENCE INFORMATION

The fourth major input to DWSP is Parameter Reference Information. This is a catalogue of information for each substance analysed on DWSP. It includes parameter name and aliases, physical and chemical properties, basic toxicology, world-wide health limits, treatment methods and uses. The Parameter Reference Information is computerized and can be accessed through the Query function of the DWSP database.

An example is shown in fig. 2.

A written copy (hard version) of the Parameter Reference Information will be available in the near future and is a new and sophisticated enhancement to the DWSP.

PROGRAM OUTPUTS

There are four major program outputs, Query, Action Alert, Report Generation and the Annual Report.

QUERY

All DWSP information is easily accessed through the Query function, therefore anything from addresses of plant personnel to complete water quality information for a plant's water supply is instantly available. The DWSP computer system makes relatively complex inquiries manageable. A personal password allowing access into the DWSP query mode in all MOE offices is being developed by the DWSP group.

ACTION ALERTS

Drinking Water quality in Ontario is evaluated against provincial objectives as outlined in the publication, Ontario Drinking Water Objectives (ISBN 0-7729-2725-1 revised 1983). This publication contains health-related Maximum Acceptable Concentrations for thirty substances. Should the reported level of a substance in treated water exceed the Ontario Drinking Water Objective an "Action Alert" requiring resampling and confirmation is issued. This assures that operational staff, health authorities and the public are notified as soon as possible of confirmation of an exceedance and remedial action taken. This report supplies a history of the occurrence of past exceedences at the plant plus a historical summary on the parameter of concern.

In the absence of Ontario Drinking Water Objectives, other agency guidelines which are documented in the Parameter Reference

Information may be used. If these guidelines are exceeded the results are flagged and evaluated by DWSP personnel. An "Action Alert" will be issued if warranted.

REPORT GENERATION

Custom reports can be generated from DWSP to meet the needs of the regions and to respond to public requests.

ANNUAL REPORTS

It is the practice of DWSP to produce an annual report containing analytical data along with companion plant information.

FIG. 1

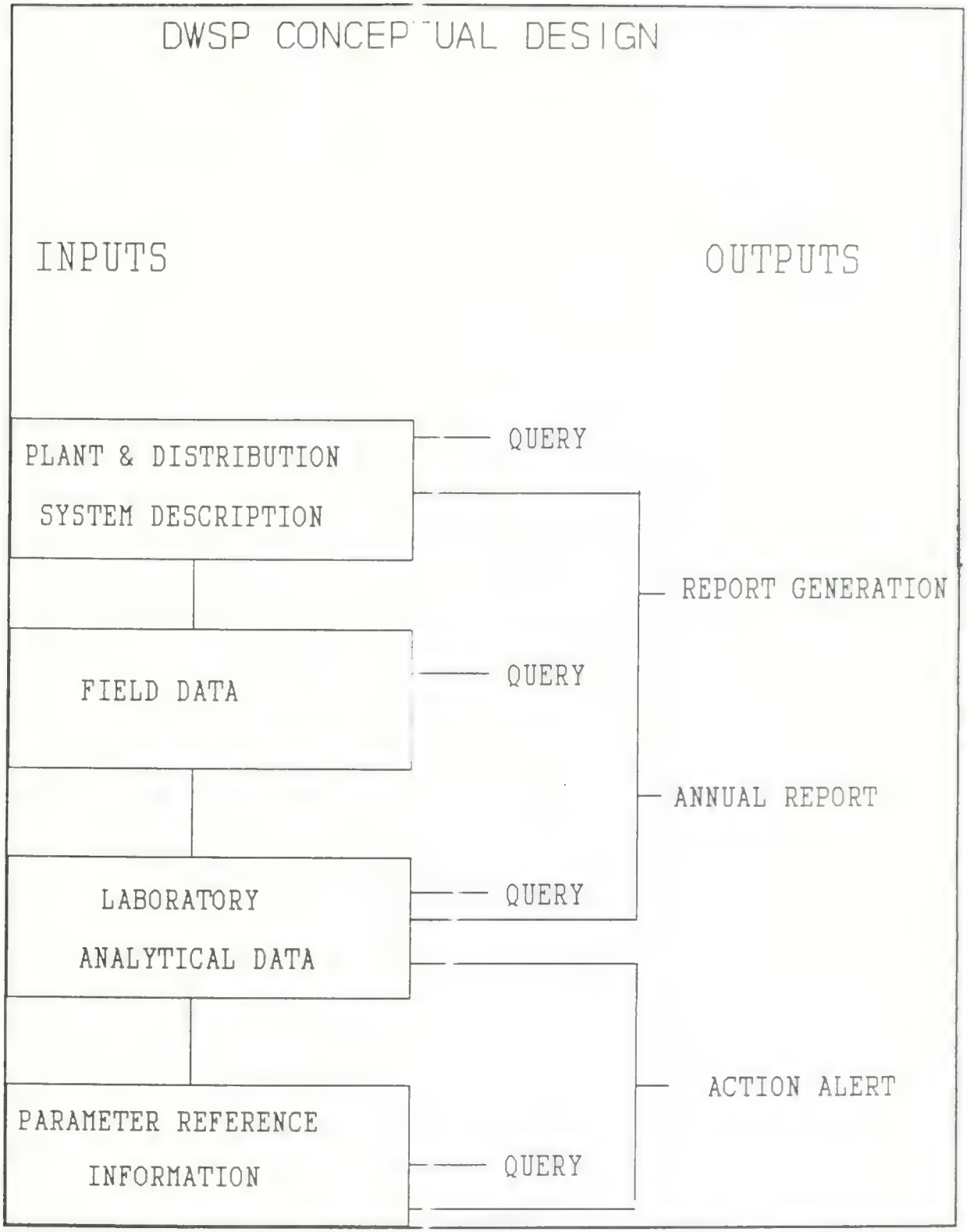
DWSP CONCEPTUAL DESIGN
INPUTS
OUTPUTS
PLANT & DISTRIBUTION SYSTEM DESCRIPTION
FIELD DATA
LABORATORY ANALYTICAL DATA
PARAMETER REFERENCE INFORMATION
QUERY
QUERY
QUERY
QUERY
REPORT GENERATION
ANNUAL REPORT
ACTION ALERT

FIG.2

MOE - DRINKING WATER ASSESSMENT PROGRAM (DWSP)

(B2001P) PARAMETER REFERENCE
BENZENE

SOURCE	FROM	TO	METHOD	TARG	UNIT	NOTE
EPA	C 86/04		NOMETH	.00	063000 UG/L	RMCL
EPAA	C 80/11		NOMETH	6.60	063000 UG/L	
FERC	C 84/05		NOMETH	1.00	063000 UG/L	
WHO	C 84/01		NOMETH	10.00	064000 UG/L	

DESCRIPTION: NAME: BENZENE
CAS#: 71432
MOLECULAR FORMULAE: C_6H_6
DETECTION LIMIT: (FOR METHOD POCODO) 0.05 UG/L
SYNONYMS: BENZOLE, COAL NAPHTHA, CARBON OIL (27),
CYCLOHEXATRIENE (41)
CHARACTERISTICS: COLOURLESS TO LIGHT YELLOW, MOBILE, NON-POLAR LIQUID, OF HIGHLY REFRACTIVE NATURE, AROMATIC, VAPOURS BURN WITH SMOKING FLAME (30)
PROPERTIES:
SOLUBILITY IN WATER: 1780-1800 MG/L AT 25 DEG C (41)
THRESHOLD ODOUR: NO DATA
THRESHOLD TASTE: 0.5 MG/L IN WATER (39)
ENVIRONMENTAL FATE: MAY BIOACCUMUALTE IN LIVING ORGANISMS, APPEARS TO BIOACCUMULATE IN ANIMAL TISSUES THAT EXHIBIT HIGH LIPID CONTENT OR ARE MAJOR METABOLIC SITES (LIVER, BRAIN), SMALL QUANITIES EVAPORATE FROM SOIL OR DEGRADE QUICKLY
SOURCES: PETROLEUM REFINING, SOLVENT RECOVERY, COAL TAR DISTILLATION, FOOD PROCESSING, TANNING.
USES: PREPERATION OF ETHYL BENZENE USED AS A STYRENE MONOMER, DETERGENTS, NYLON, AS INTERMEDIATE IN PESTICIDE PRODUCTION, SOLVENT IN RUBBER INDUSTRY, DEGREASING AND CLEANSING AGENT, GASOLINE.
TOXICITY: RATING 4 (VERY TOXIC); ACUTE - IRRITATES MUCOUS MEMBRANES, SYMPTONS INCLUDE RESTLESSNESS, CONVULSIONS, DEPRESSION, RESPIRATORY FAILURE; CHRONIC - ANEMIA AND LEUKEMIA (45).
CARINOGENICITY: HUMAN CARCINOGEN AND MUTAGEN
REMOVAL: GAC ADSORPTION, PRECIPITATION WITH ALUM FOLLOWED BY SEDIMENTATION, COAGULATION AND FLOCCULATION, SOLVENT EXTRACTION, OXIDATION (41).
MOLECULAR WEIGHT: 78.12 GRAMS
MELTING POINT: 5.5 DEGREES C (27)
BOILING POINT: 80.1 DEGREES C (27)
SPECIFIC GRAVITY: 0.879 AT 20 DEGREES C (27)
VAPOUR PRESSURE: 100 MM AT 26.1 DEGREES C
HENRY'S LAW CONSTANT: 0.00555 ATM M_3/MOLE
LOG OCT./WATER PAR.COEFF: K=1.0 1/N=1.6 R=.97 PH=5.3

Appendix B

DWSP SAMPLING GUIDELINE

i) RAW and TREATED at PLANT

General Chemistry	-500 mL clear plastic bottle -rinse bottle with sample three times and discard water -fill to line
Bacti	-250 mL clear glass bottle with white seal on cap -do not rinse bottle; preservative has been added -avoid touching bottle neck or inside of cap -fill to top of red label as marked
Metals	-500 mL clear plastic bottle with white lid -rinse bottle and cap three times, discard -fill to line -add 10 drops nitric acid (**Caution:** HNO_3 is corrosive)
Volatiles (OPOPUP)	-250 mL clear glass bottle -do not rinse bottle -tilt bottle when filling -fill bottle completely; there should be no air bubbles.
Organic (OWOC),(OWTRI),(OAPAHX)	-1 liter brown glass bottle per scan -do not rinse bottle -fill to approx. 1" from top -when 'special pesticides' are requested three extra bottles per sample must be submitted
Cyanide	-500 mL clear plastic bottle -do not rinse bottle -fill to approx. 1" from top -add 10 drops sodium hydroxide (**Caution:** NaOH is corrosive)

Mercury	-250 mL clear glass bottle -rinse bottle and cap three times, discard then fill to top of label -add 20 drops each nitric acid and potassium dichromate (**Caution:** HNO_3 and $KCrO_7$ corrosive)
Phenols	-250 mL clear glass bottle -do <u>not</u> rinse bottle -fill to top of label as marked

<u>Steps</u>

1. Let cold water tap run for several minutes.
2. Record time in submission sheet.
3. Record teperature on submission sheet.
4. Fill up all bottles as per instructions.
5. Record chlorine residuals (free, combined and total for treated water only), turbidity and pH on submission sheet.

ii) Distribution Samples (standing water)

General Chemistry	-500 mL clear palstic bottle -rinse bottle with sample three times and discard -fill to line
Metals	-500 mL clear plastic bottle with white lid -rinse bottle and cap three times, discard -fill to line -add 10 drops nitric acid (**Caution:** HNO_3 is corrosive)

Steps:

1. Record time on submission sheet.
2. Place bucket under tap and open cold water.
3. Fill to predetermined volume.
4. After mixing the water, record the temperature on the submission sheet.
5. Fill general chemistry and metals bottles.
6. Record chlorine residuals (free, combined and total), turbidity and pH on submission sheet.

iii) Distribution Samples (free flow)

General Chemistry	-500 mL clear plastic bottle -rinse bottle with sample three times and discard water -fill to line
Bacti	-250 mL clear glass bottle with white seal on cap -do <u>not</u> rinse bottle; preservative has been added -avoid touching bottle neck or inside of cap -fill to top of red label as marked
Metals	-500 mL clear plastic bottle with white lid -rinse bottle and cap three times, discard -fill to line -add 10 drops nitric acid (**Caution:** HNO_3 is corrosive)
Volatiles (OPOPUP)	-250 mL clear glass bottle -do <u>not</u> rinse bottle; preservative has been added -tilt bottle when filling -fill bottle completely; there should be no air bubbles
Organic (OWOC),(OWTRI)	-1 liter brown glass bottle per scan -do <u>not</u> rinse bottle: preservative has been added -fill to approx. 1" from top
Cyanide	-500 mL clear plastic bottle -do <u>not</u> rinse bottle: preservative has been added -fill to approx. 1" from top -add 10 drops sodium hydroxide (**Caution:** NaOH is corrosive)
Mercury	-250 mL clear glass bottle -rinse bottle and cap three times, discard then fill to top of label -add 20 drops each nitric acid and potassium dichromate (**Caution:** HNO_3 and KCrO7 corrosive)

Steps:

1. Record time on submission sheet.
2. Let cold water flow for five minutes.
3. Record temperature on submission sheet.
4. Fill all bottles as per instructions.
5. Record chlorine residuals (free, combined and total), tubidity and pH on submission sheet.